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AN INTRODUCTION TO THE IDENTIFICATION OF CHIRONOMID LARVAE

William T. Mason, Jr.

Federal Water Pollution Control Administration
Cincinnati, Ohio

March 1968

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The Cincinnati Laboratory of the Division of Pollution Surveillance collects, interprets, and disseminates biological, physical, and chemical data pertaining to the quality of the Nation's surface waters. Beginning in 1963, the Benthos Laboratory has conducted studies in the Ohio, Tennessee, Mississippi, Missouri, and Klamath River basins, and in Lake Tahoe. The photographs in this guide were taken largely from these collections.

AN INTRODUCTION TO THE IDENTIFICATION OF CHIRONOMID LARVAE

by

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INTRODUCTION

Larvae of the dipteran family Chironomidae (midges) form a significant portion of the macroinvertebrate fauna in most freshwater habitats. They are an important link in the food chain between algae and microinvertebrates, and the larger macroinvertebrates and fish.

Biologists investigating lakes and streams have found that midge larvae of certain genera and species live with other macroinvertebrates in pollution-associated communities. Gaufin and Tarzwell (1952, 1955, and 1956), Paine and Gaufin (1956), and Gaufin (1958), Curry (1965), and Carr and Hiltunen (1965) have reported larvae that are able to live in waters with low dissolved oxygen concentrations. However, as a family, the larvae exhibit a wide range of tolerance to environmental factors and live in both "clean" and "polluted" waters. Therefore, in order to gain maximum information concerning the effects of pollution on the midge fauna, it is necessary to carry identifications beyond the family level.

This guide is intended to serve as a beginner's supplement to the more definitive descriptions of chironomid larvae by Johannsen (1934-37), Roback (1957), Curry (1961), Darby (1962), and Beck and Beck (1966), which take into account a variety of head and body characteristics for classification. Head capsules of various species are pictured to complement the keys to subfamily and genus, and to familiarize the beginner with structures that are used for identification.

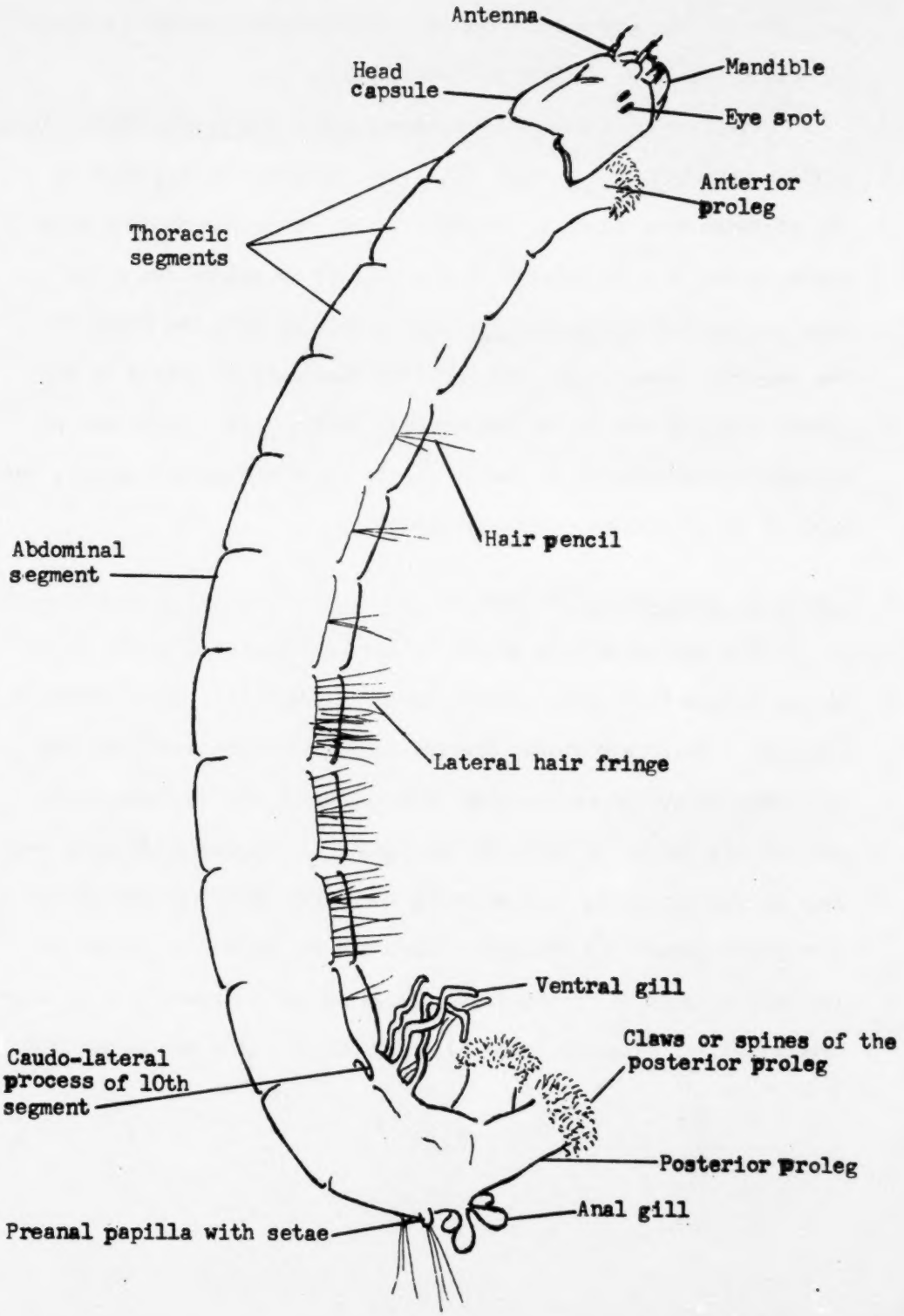
GENERAL CHARACTERISTICS

Chironomid larvae construct silken cases which are attached to sticks and stones, or build tubes in the bottom substrates of lakes and streams. The larvae may be various shades of yellow, green, and red when living. The wormlike appearance and large size of the red larvae (containing a hemoglobin, erythrocruorin) brought about the common name "bloodworm" for the larvae as a group. The term is a misnomer, but serves to bridge the gap between the layman and biologist.

The larvae range from only a few to over 20 millimeters (mm) in length. The head capsule is sclerotized and contains sensory structures and a feeding apparatus. Posterior to the head are 12 body segments. The first three segments become swollen before pupation and enclose the cephalo-thorax of the developing pupa. The general diagrammatic sketch of a chironomid larva (Figure 1) indicates some of these morphological characteristics.

The body is usually provided with scattered hairs, tufts, or hair fringes on the lateral margins. Paired prolegs are present on the first thoracic segment and on the last abdominal segment. The prolegs bear spines and/or claws clustered at their distal margins. Preanal papillae with setae are located dorsad on the last abdominal segment. The papillae may have a sclerotized area with a projecting

Figure 1. Schematic Drawing of A Chironomid Larva



"spur." Two to six anal "gills" are located between the preanal papillae and the posterior prolegs. These structures may be short and sausage-shaped, or long and attenuated.

The larvae of some Chironominae, e.g., Chironomus (Chironomus) sp. and Chironomus (Einfeldia) sp., possess "bloodgills" on the eleventh body segment. These tubular structures usually originate on the ventral surface of the segment in one or two pairs. However, in some Glyptotendipes they originate from the sides of the segment eleven. The length of the "bloodgills" depend on the instar stage of the larva (Hilsenhoff, 1966). Also, there may be tubular, caudo-lateral processes on the tenth abdominal segment, the size of which will vary with maturity.

Subfamily Tanypodinae (Figure 2)

The larvae of this subfamily are distinguished by the fork-shaped lingua (=glossa), superlinguae (=paraglossa), and retractile antennae. These structures are embedded inside the head, and are best seen after the capsule has been cleared. The antennal ratio (AR) of the larva, or ratio of the length of the basal antennal segment to the remaining four segments combined, is often used to differentiate genera and species. There are no paralabial plates on the ventral side of the head capsule as in the Chironominae and some Orthocladiinae (Figures 3 and 4). Paralabial combs may be present

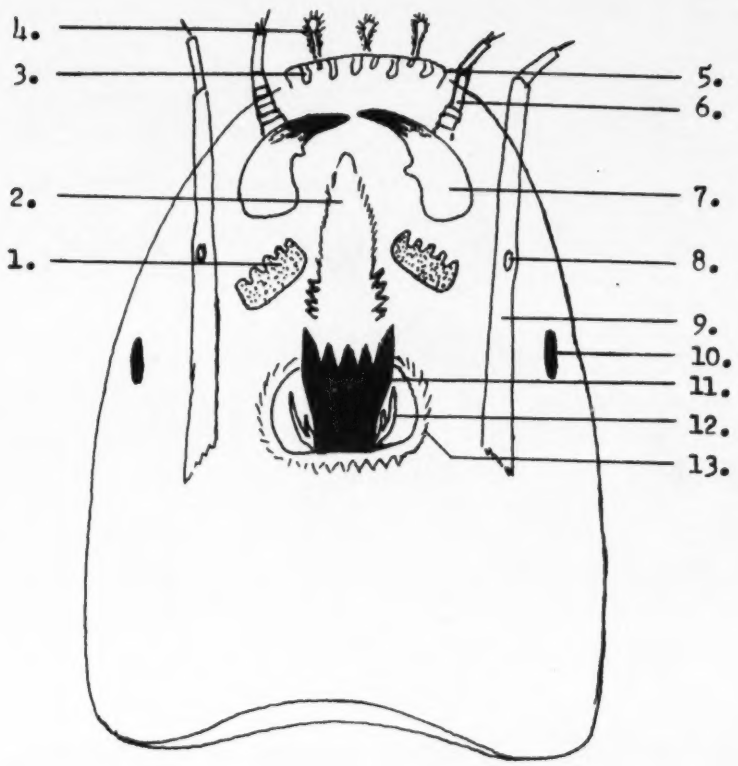


Figure 2. Schematic head capsule diagram of the Subfamily Tanypodinae (ventral view)

1. Paralabial comb(may be absent)
2. Labium
3. Sense vesicles of labrum
4. Clavate bristles of labrum
5. Labrum
6. Maxillary palpus
7. Mandible
8. Ring organ of antenna
9. Antenna (retractile)
10. Eye spot
11. Lingua of hypopharynx
12. Superlingua
13. Suspensorium of hypopharynx

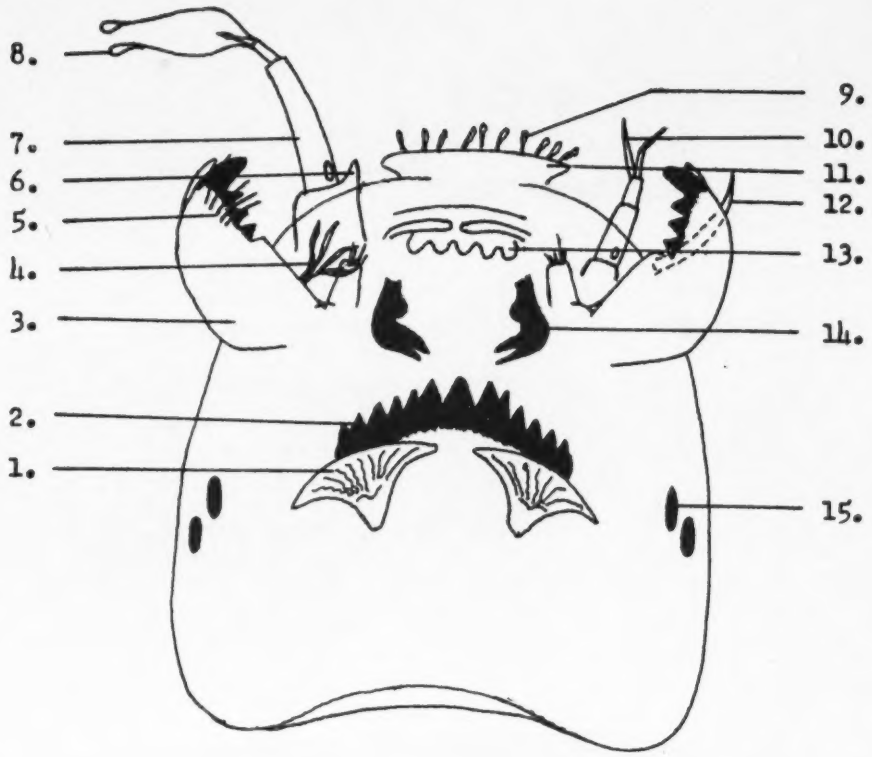


Figure 3. Schematic head capsule diagram of the Subfamily Chironominae (ventral view)

1. Striate paralabial plate
2. Labial plate
3. Mandible (note the dark lateral and light dorso-mesal teeth)
4. Mandibular brush
5. Preapical mandibular comb
6. Antennal tubercle with spur (Tanytarsini only)
7. Antenna on tubercle
8. Lauterborn organ on long petiole (Tribe Tanytarsini)
9. Papilla of labrum
10. Antennal blade
11. Labrum
12. Accessory tooth of mandible
13. Epipharyngeal plate
14. Premandible
15. Eye spot

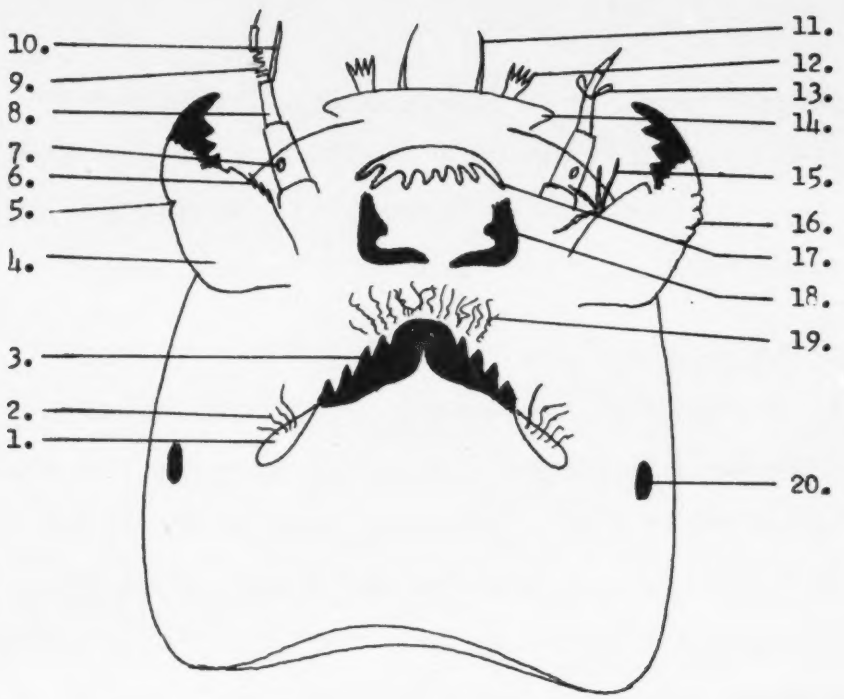


Figure 4. Schematic head capsule diagram of the Subfamilies Diamesinae and Orthocladiinae (ventral view)

1. Non-striate paralabial plate (may be absent or vestigial)
2. Paralabial hairs (beard)
3. Labial plate
4. Mandible
5. Concavity of mandible
6. Mandibular serration
7. Ring organ of antenna
8. Antenna
9. Annulated third antennal segment (Diamesinae only)
10. Antennal blade
11. Labral bristle
12. Labral spine
13. Lauterborn organ of antenna
14. Labrum
15. Mandibular brush
16. Mandibular crenulations
17. Finger processes of epipharynx
18. Premandible
19. Hypopharyngeal hair
20. Eye spot

in Procladius and some species of Anatopynia. The mandibles are characteristically scythe-shaped and usually do not have prominent lateral teeth. The number of basal segments of the maxillary palpi are used in making generic determinations of the Pentaneurini.

Subfamily Chironominae (Figure 3)

All of the larvae possess a pair of striated, paralabial plates. However, in a few genera, e.g., Stenochironomus, the striations are barely evident. The labial plate has strong, dark teeth that project forward. The last lateral teeth of the labial plate may be partially covered by the paralabial plates. The mandibles are strong, and usually have dark, lateral teeth, a preapical mandibular comb, a large accessory tooth, and a filamentous brush on the inner basal margin. Also, spines (serrations) are sometimes present on the inner basal margin. The premandibles are usually bifid (ending in two blades)but may end in five or six blades.

The subfamily is divided into the tribes Tanytarsini and Chironomini. The Tanytarsini have long, curved, first antennal segments mounted on conspicuous tubercles. Except for Zavrelia, the paralabial plates are wider than long, and meet on the midline of the head capsule. Paired, leaflike structures, lauterborn organs, are mounted on either long or short petioles attached to the second antennal segment. The accessory tooth of the mandible is longer and more sharply pointed than in the Chironomini. In comparison, the antennal

tubercles of the Chironomini are inconspicuous, and the lauterborn organs are less prominent. Except for Xenochironomus and Pseudochironomus, the paralabial plates are distinctly separated and do not meet at the midline of the head capsule.

Subfamily Orthocladiinae (Figure 4)

The larvae never possess striated paralabial plates as do the Chironominae. Some genera, however, have paralabial plates that are rugose or bear hairs. When present, the paralabial plates appear as oblong, caudo-lateral extensions of the labial plate or as vestigial structures. The shape and size of the lateral, mandibular teeth are extremely variable. There may be a mandibular brush and spines on the inner basal margin. The premandibles usually end in a single blade, but in some genera they are bifid. Generally, the teeth of the labial plates are arranged in an even, convex curve. In some genera, e.g., Psectrocladius, the lateral teeth of the labial plates are partially fused.

A branch of the Orthocladiinae are marine midges (recognized by some taxonomists as a separate subfamily Clunioninae). The larvae are restricted to intertidal rocks on seacoasts. Four genera are found on the coastline of California. The anal gills are absent and the antennae usually are three segmented. The median tooth is usually peaked. For further details see Wirth and Stone (1963).

Few larvae in this subfamily have been associated with adults. In some cases, it is not possible to carry the identification further than genus.

Subfamily Diamesinae (Figure 4)

Superficially, these larvae resemble the Orthocladiinae. However, they are distinguished by annulations on the third antennal segment. Slides must be made to see the annulations.

Subfamily Podonominae (no figures or photographs)

The larvae have no premandibles. The hypopharynx has a conspicuous row of lamellar rods protruding forward, and the labial plate has an odd number of teeth (usually 15). The third antennal segment is annulated in some species (Brundin, 1966). Brundin (p. 95) states that members of this subfamily are distributed across northern North America and down into the Rocky Mountains of Colorado and Sierra Nevada of California. However, the fauna in the United States is poor, consisting of only five genera and 18 species.

METHODS

The head capsule or entire body (depending on the size of the larva) was placed in a crucible containing 5-10% KOH solution and heated until the muscle tissue was digested. The cleared specimens were rinsed in distilled water, transferred to absolute alcohol and

mounted on a slide, ventral side up, in Turtox* diaphane. The coverslips were pressed gently with a lead pencil eraser to better expose the parts necessary for identification.

The photographs of the head capsules were taken with Kodax* Plus X film using a Zeiss* photomicroscope equipped with polarizing filters. The classification scheme of Freeman as followed by Sublette and Sublette (1965) in the U. S. Department of Agriculture Handbook, No. 276, is used in this guide. The handbook is very useful in translating synonymous nomenclature for midges based on Meigen's publication in 1800 using the name Tendipes (Tendipedidae) and his 1803 publication using the name Chironomus (Chironomidae) for the same insect. The Plenary Powers of International Commission on Zoological Nomenclature in Opinion 678, 1963 suppressed the pamphlet published by Meigen in 1800.

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*Mention of commercial sources does not constitute endorsement by the FWPCA.

Key to the Subfamilies of Chironomidae

1. Head capsule with a fork-shaped lingua; antennae retractile into sheaths embedded in the head (Fig. 5)..... Tanypodinae

   No fork-shaped lingua; antennae not retractile..... 2

2. Premandibles absent..... Podonominae

   Premandibles present (Fig. 6)..... 3

3. Paralabial plates with striations (Fig. 6)..... Chironominae

   Paralabial plates, if present, without striations..... 4

4. Third segment of antennae with annulations(Fig. 7). Diamesinae

   Third segment without annulations (Fig. 8)..... Orthocladiinae

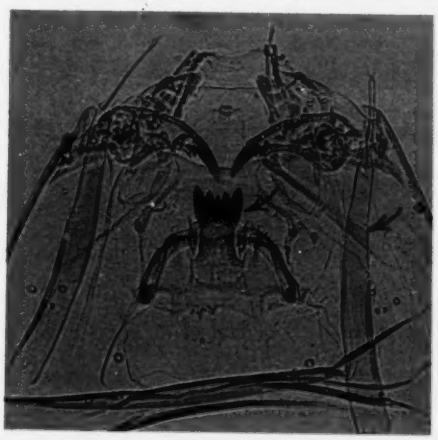

Figure 5. Tanypodinae

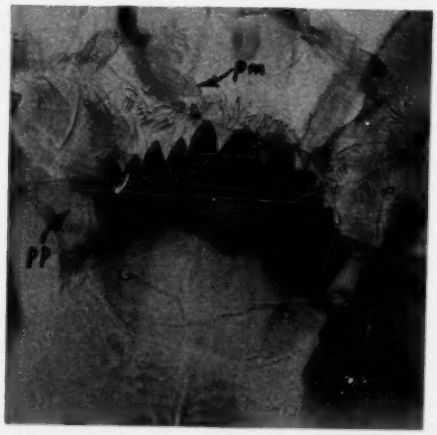

Figure 6. Chironominae

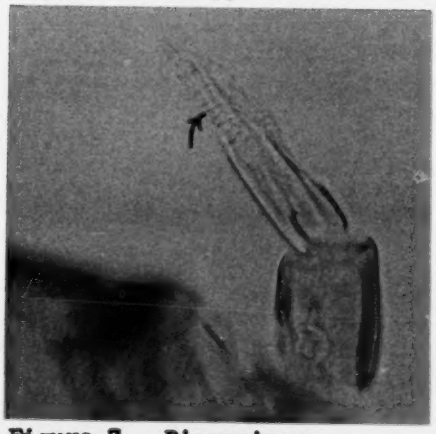

Figure 7. Diamesinae

Figure 8. Orthocladiinae

KEY TO COMMON GENERA

Subfamily Tanypodinae

1. Paralabial combs present (page 32) 2
   Paralabial combs absent 4

2. Lingua with 4 equal teeth; mandible with 4-5 teeth on the inner shoulder (page 33) ..... *Anatopynia* (*Psectrotanypus*)
   Lingua with 5 teeth 3

3. Lingua with subequal, light teeth (page 29) .....*Tanypus*
   Lingua with black teeth; middle tooth shortest (page 32) ..... *Procladius*

4. Lingua with 6 teeth (not pictured) ..... *Clinotanypus*
   Lingua with an odd number of teeth 5

5. Lingua with 7 light teeth (page 34) ..... *Coelotanypus*
   Lingua with 5 dark teeth; the inner 3 sometimes with light tips .....Tribe Pentaneurini 6

6. More than one basal, palpal segment (page 31) .. *Ablabesmyia*
   One basal, palpal segment ..... Other Pentaneurini

Subfamily Chironominae

Tribe Tanytarsini: antennal tubercles prominent, as long as wide or longer; 1st antennal segment long and curved 23
Tribe Chironomini: antennal tubercles much wider than long; 1st antennal segment not long and curved 1

1. Paralabial plates nearly touch at the midline (page 46) 2
   Paralabial plates distinctly separated 3

2. Paralabial plates approximately 3 times wider than long and pointed at inner apices; lateral teeth of mandibles low and indistinct (page 46) ..... *Chironomus* (*Xenochironomus*)
   Paralabial plates approximately 4 times wider than long and rounded at inner apices; lateral teeth of mandible large and distinct (page 51) ..... *Pseudochironomus*

3. Antennae with 5 segments 4
   Antennae with 6 segments 17

4. Labial plate with an odd number of teeth (usually 13 or 15) . 5
Labial plate with an even number of teeth (usually 14 or 16). 13

5. Middle tooth wide and light, flanked by oblique rows of darker lateral teeth (page 40) .. Chironomus (Cryptochironomus)
Middle tooth of labial plate as dark as laterals; laterals not oblique 6

6. Labial plate with 15 teeth 7
Labial plate with 13 teeth; middle tooth may be trifid or deeply notched, appearing as 3 separate teeth (page 35) 8

7. Middle tooth of labial plate low, not longer than 1st laterals and notched on its dorso lateral margins; accessory tooth of mandible fringed (page 44) ... Chironomus (Endochironomus)
Middle tooth of labial plate largest and without notches; slightly longer than 1st laterals; outer lateral teeth may project forward or be as long as inner laterals (page 43) ... . Chironomus (Cryptochironomus) (= Harnischia)

8. Middle tooth of labial plate low, 1/3rd wider at base than long, rounded and not longer than 1st laterals; 11th body segment without ventral bloodgills, a small pair may be present on the sides of the 11th body segment (page 49) .... Glyptotendipes
Middle tooth as long as wide at its base, curving evenly to apex; may be simple, have lateral notches, or be completely trifid 9

9. Middle tooth of labial plate completely trifid or with deep notches at its base; 11th body segment usually with 2 pairs of ventral bloodgills; tubular caudo-lateral processes may be present on 10th body segment (page 35). Chironomus (Chironomus)
Middle tooth simple; lateral notches may be present midway of its length 10

10. Middle tooth at labial plate with deep, posteriorly directed notches, midway of its length; usually with a median node; epipharyngeal plate with 15 to 20 teeth 11
Middle tooth curving evenly to apex and may have shallow, lateral notches midway of its length; epipharyngeal plate with 3 to 5 rounded teeth 12

11. Second lateral teeth of labial plate with flanges, mandibles with a mesal tooth perpendicular to the lateral teeth; premandibles abruptly curved, ending in 2 blades; 1 pair of bloodgills (page 48) .... Goeldichironomus
Labial plate and mandibles not as above; premandibles ending in 5 blades; 1 pair of bloodgills (page 37) .... Chironomus (? Kiefferulus)

12. The 3rd lateral tooth of mandible unequally compound; 5th and 6th lateral teeth of labial plate fused; 11th body segment with 1 pair of ventral bloodgills (page 36) .... Chironomus (Einfeldia)
Third lateral tooth of mandible equally compound or simple; 5th and 6th laterals not fused; no bloodgills on 11th segment (page 38) ... Chironomus (Dicrotendipes)
(page 50A) ..... Glyptotendipes senilis

13. Labial plate with a cleft median tooth (appearing as 2 teeth); laterals sharply pointed and equal in length; mandibles with 2 lateral teeth (page 41) .... Chironomus (Cryptochironomus) (= Harnischia)
Labial plate not as above 14

14. Labial plate with middle and 2nd lateral teeth nearly even in height and longer than 1st laterals; inner margin of mandibles may have serrations; anal gills attenuated and constricted at the middle (page 52) .... Polypedilum
Labial plate with 1st and 3rd laterals longer than 2nd laterals; middle 4 teeth projecting above other laterals 15

15. Middle teeth and 1st laterals cleft equally deep; paralabials coarsely striate (page 45) Chironomus (Tribelos)
Middle teeth with cleft not as deep as 1st laterals 16

16. Middle teeth of labial plate pointed and even with 1st laterals; accessory tooth of mandible straight (not pictured) ..... Phaenopsectra
Middle teeth of labial plate more rounded and smaller than 1st laterals; accessory tooth of mandible curved at tip (page 53) ..... Chironomus (Endochironomus)

(NOTE: Phaenopsectra, Chironomus (Endochironomus), and C. (Tribelos) are difficult to separate by larval characteristics. Couplets 15 and 16 should be considered artificial at this time.)

17. Labial plate with 13 teeth; middle tooth wide and light; laterals dark and not higher than middle tooth (page 54) ..... Paralauterborniella
Labial plate with an even number of teeth 18

18. Labial plate with 10 low, rounded, black teeth; labial plate distinctly concave in appearance; paralabial plates indistinct (page 56) ..... Stenochironomus
(= Cryptochironomus sens. lat. sp. B Joh.)
Labial plate with more than 10 teeth 19

19. Labial plate with 12 or 14 teeth; middle pair of teeth lighter than laterals 20
Labial plate with 16 teeth; middle pair of teeth may be lighter than laterals 21

20. Outer margin of mandibles with 2 concavities, each with a large bristle (page 60) ..... Microtendipes
Outer margin of mandibles with 1 bristle (page 55) .....
..... Paralauterborniella

21. Middle 4 teeth of labial plate lighter than laterals; 4th laterals longest (not pictured) ..... Paratendipes
All teeth of labial plate unicolorous, middle 4 teeth projecting above 2nd laterals; striations of paralabial plates indistinct 22

22. First lateral teeth of labial plate larger than middle pair (page 59) ..... Stictochironomus
Middle pair of teeth larger than 1st laterals (page 57) .....
..... Stenochironomus

Tribe Tanytarsini

23. Paralabial plates pointed at inner apices and clearly separated (page 62) ..... Zavrelia
Paralabial plates blunt at inner apices and meet at the midline of the head capsule 23

24. Antennal tubercles with a spur; petioles of lauterborn organs approximately 3X the length of the last 3 antennal segments (page 63) ..... Micropsectra
Antennal tubercles without a spur; petioles of lauterborn organs shorter (page 61) ..... Tanytarsus
(= Calopsectra)

Subfamily Diamesinae (annulated 3rd antennal segments)

Labial plate with an odd number of teeth; middle tooth and 1st lateral teeth may be lighter than other laterals; paralabial plates absent (page 64) ..... Diamesa

Labial plate with dark teeth; middle teeth indistinct; paralabial plates present, sometimes with hairs (page 66) .... Prodiamesa

Subfamily Podonominae (see text, page 10)

Subfamily Orthocladiinae

1. Antennae at least 1/2 as long as head, or longer 2
   Antennae shorter usually about as long as the mandibles 3

2. Labial plate with an odd number of teeth; middle tooth shorter than 1st laterals; 2nd and/or 3rd antennal segments dark (page 86) ..... Corynoneura
   Labial plate with an even number of teeth; a distinctive gap between the middle teeth; antennal segments never dark (page 75) ..... Brillia

3. Labial plate with an odd number of teeth 4
   Labial plate with an even number of teeth 12

4. Teeth of labial plate low and even in length; middle tooth 1/3 the width of plate and broadly truncate; 11 black teeth (page 76) ..... Cardiocladius
   Labial plate not as above 5

5. Middle tooth of labial plate much smaller than, and recessed between, the large 1st lateral teeth (page 74) .... Brillia
   Middle tooth as long as the 1st lateral teeth 6

6. Labial plate with middle tooth or teeth distinctly lighter than laterals, or middle tooth peaked 7
   Labial plate with all teeth unicolorous; middle tooth not peaked 9

7. Labial plate truncate with an even row of 4-7 small, light teeth projecting above dark laterals (not pictured) .... Smittia
   Labial plate not truncate 8

8. Middle tooth of labial plate dome-shaped and/or peaked; mandibles without serrations on inner margins (page 78) ..... Psectrocladius
Middle tooth not dome-shaped; mandibles with serrations (page 83)..... Cricotopus

9. Outer edge of mandibles crenulated (crenulations may be fine) (page 84) ..... Cricotopus
Outer edge of mandibles without crenulations 10

10. Third antennal segment 1/7th the length of the 2nd segment; labial plate with 9 or 11 teeth (page 73).Smittia
Third segment closer to 1/4 to 1/2 the length of the 2nd segment 11

11. Labial plate with 7, 11, or 13 teeth (if 11, the 1st laterals are notched); mandibles may have serrations on inner margins and the inner shoulder is dark with a projecting point; premandibles simple or bifid; lateral hair tufts may be present on some of the body segments (page 83) ..... Cricotopus
Labial plate with 13, 17, and 19 teeth that curve in an even convex arc; mandibles without serrations; premandibles simple; body without hair tufts (page 68) .... Orthocladius

12. Middle teeth of labial plate fused into a clear, wide tooth, often with 2 dark, closely separated tips near the center of the plate; lateral teeth dark and nearly fused; paralabial plates present; mandibles scythe-shaped (page 77) ..... Psectrocladius
Middle teeth of labial plate as dark as laterals 13

13. Labial plate with 10-12 teeth 14
Labial plate with 14 teeth 18

14. Labial plate with 10 teeth; middle pair fused almost their entire length and greatly elongated (page 72) .... Nanocladius
Labial plate with 12 teeth 15

15. Labial plate with black teeth; middle pair largest and not fused; paralabials absent (page 80)..... Metriocnemus
Middle teeth of labial plate brown, partially fused or narrowly separated; paralabial plates may be present 16

16. Middle teeth of labial plate fused almost their entire length and elongated; paralabial plates without hairs (page 79)..... Psectrocladius
Middle teeth not elongated; may be fused at base 17

17. Middle teeth of labial plate spadelike ; paralabial plates with hairs; mandibles without serrations (page 70) ..... Trichocladius
Middle teeth rounded and narrowly separated; paralabial plates absent; mandibles with serrations or a long, flat, wide filament or inner margins (page 71) .... Nanocladius

18. Middle 4 teeth of labial plate light and even in height, shorter than 2nd laterals (page 81) ..... Metriocnemus
Middle 4 teeth dark or all teeth relatively even in height 19

19. Paralabial plates crescent-shaped and with hairs; mandibles dark at least 1/2 of their length (page 82) .... Diplocladius
Paralabial plates not crescent-shaped and hairs absent; mandibles dark only near the tips (page 69) .... Orthocladius

DISTINGUISHING HEAD CAPSULE CHARACTERISTICS

Family Chironomidae

Subfamily Tanypodinae (approximately 12 genera; 5 pictured)

Tanypus: The lingua has 5 light teeth that are nearly equal in length. Paralabial combs are present with short, stubby teeth. The antennae are about 1/3 as long as the head capsule and the basal portions of the mandibles are robust.

Tribe Pentaneurini (represented by Ablabesmyia): The lingua has 5 pointed, dark teeth; the middle 3 sometimes with light tips. Paralabial combs are absent. The antennae are about 1/2 as long as the head capsule. For specific determinations consult Beck and Beck (1966).

Procladius: The lingua has 5 black teeth. Paralabial combs are present. The antennae are about 1/4 as long as the head capsule.

Anatopynia (Psectrotanypus): The lingua has 4 stubby, light teeth. Paralabial combs are present. Each mandible has approximately 5 prominent lateral teeth near the inner shoulder.

Coelotanypus: The lingua has 7 light teeth. Paralabial combs are absent. However, there are 2 rows of chitin points in the hypopharynx.

Subfamily Chironominae (approximately 15 genera; 11 pictured)

Chironomus (Chironomus): The labial plate has 13 teeth; the middle tooth completely trifid, or deeply notched near its base. The premandibles are bifid. Each mandible has a dark, terminal tooth, a light dorso-mesal tooth, and usually 3 sharply-pointed, dark lateral teeth (in some species the 3rd lateral tooth is light). The epipharyngeal plate has approximately 15 to 20 sharp teeth. Usually there are 2 pairs of ventral bloodgills. However, C. (Chaetolabis) 2 spp. (not keyed) also possess 2 pairs of ventral bloodgills.

C. (Einfeldia): The labial plate has 13 teeth and is quite similar to that of C. (Dictrotendipes) except that the 5th and 6th lateral teeth are fused and the plate is deeply indented on its basal, lateral margins. The mandibles are deeply indented at the inner shoulders and the 3rd lateral tooth is unequally compound.

C. (Kiefferulus): The labial plate of this subgenus appears to be intermediate between those of C. (Dicrotendipes) and and C. (Chironomus). The middle tooth is not trifid but has deep, lateral notches directed posteriorly about 1/3 of the distance from its peaked apex. There is 1 pair of ventral bloodgills.

C. (Dicrotendipes): The labial plate has 13 teeth; the middle tooth may appear simple in mature larvae, but is notched midway of its length in early instars. The mandibles are similar to those of C. (Chironomus) except the lateral teeth are more rounded and not as sharp. In C. (Dicrotendipes) nervosus the 3rd lateral tooth of the mandible is equally compound. The head capsules of some species have a dark, median stripe, dorsally. The premandibles are bifid. The epipharyngeal plate usually has 5 rounded teeth.

C. (Cryptochironomus): The labial plate usually has an odd number of teeth; the middle tooth is light, wide, and rounded, and is flanked by oblique rows of darker lateral teeth, or the teeth of the labial plate are sharply pointed and relatively even in length; the last 2 or 3 lateral teeth are as long as the inner laterals and appear upturned. The premandibles are bifid or palmate, ending in 3-5 blades.

C. (Endochironomus): The labial plate has 15 or 16 teeth; in the species with 15 teeth, the middle tooth is low and rounded, with dorso-lateral notches; the 4th lateral teeth are smallest; in the species with 16 teeth, the labial plates are quite similar to C. (Tribelos) and Phaenopsectra in that the 4 middle teeth project above the laterals.

C. (Tribelos): The labial plate has 16 teeth; the middle teeth are slightly shorter than the 1st lateral teeth; the 2nd lateral teeth are shorter than the 3rd lateral teeth. The antennae have 5 segments, in contrast to the 6 segmented antennae of Stictochironomus.

C. (Xenochironomus): The labial plate in mature larvae has even, low rounded teeth. The paralabial plates touch at the midline. The lateral teeth of the mandibles are barely apparent. In X. xenolabis, the labial plate has alternating large and small teeth in the immature larva, but the small teeth are not present in the mature larva. The paralabial plates are close but do not touch at the midline. For specific determinations consult Roback (1965).

Goeldichironomus: The labial plate has 13 teeth; the middle tooth with deep lateral notches and the apex with a median node. The 2nd lateral teeth have light lateral flanges and the premandibles are curved abruptly and end in 2 short, subequal blades. The mandible has a mesal tooth perpendicular to the lateral teeth and a long accessory tooth. The species pictured is synonymous with C. fulvipilus.

Glyptotendipes: The labial plate has 13 teeth. In mature larvae the middle tooth, characteristically, is low and broadly rounded or squared with minute dorso-lateral notches, and shorter than the 1st lateral teeth. G. senilis is an exception. The middle tooth is slightly longer than the 1st lateral teeth and is notched midway of its length as in C. (Dictrotendipes). G. senilis was described by Johannsen (1937b) and figures were presented by Roback (1957).

Pseudochironomus: The labial plate has 9 or 11 teeth; the middle tooth low and rounded; the 2nd lateral teeth are smallest; the species pictured (P. fulviventris) has bifid 5th lateral teeth. The paralabial plates are approximately 4 times as wide as long and nearly touch at the midline.

Polypedilum: The labial plate has 16 teeth; generally the middle and 2nd lateral teeth are the largest and the 1st lateral teeth are small. The inner margins of the mandibles often have serrations.

Phaenopsectra: The labial plate has 16 teeth. The middle teeth are the same length as the 1st laterals. The mandibles have at least 3 lateral teeth. This genus is discussed in Johannsen (1937b) as Pentapedilum and in Roback (1957) as Tanytarsus (Tanytarsus) obediens.

Paratendipes: The middle 4 teeth of the labial plate are lighter than the lateral teeth and are shorter than the 4th laterals which give the middle of the plate a concave appearance. The labial plate has 16 teeth and the antennae are 6-segmented.

Paralauterborniella: The labial plate has either 1 clear, wide, middle tooth or 2 light, middle teeth, but the lateral teeth are not oblique as in Chironomus (Cryptochironomus) sp.

Stenochironomus: The labial plates are variable. The striations of the paralabial plates are either indistinct or punctations are present. The antennae have 6 segments.

Stictochironomus: The labial plate has 16 teeth; the middle 4 teeth projecting; the 1st and 3rd lateral teeth are largest. The mandibles have serrations on their inner margins and the outer margins are distinctly flattened. The antennae have 6 segments.

Microtendipes: The labial plate has 14 teeth; the 2 middle teeth are light; the 1st lateral teeth are shorter than, and are fused to, the 2nd laterals.

Tribe Tanytarsini (4 genera; 3 pictured)

Tanytarsus: The antennae are mounted on prominent tubercles. There are no "spurs" on the tubercle. The paralabial plates meet at the midline and are truncate at either end. The labial plate has 11 teeth, and the middle tooth usually has lateral shoulders that are darker than the center of the tooth. Lauterborn organs may be mounted on petioles shorter or longer than the last 3 antennal segments.

Zavrelia: The antennal tubercles have "spurs" and the paralabial plates are pointed at the inner apices.

Micropsectra: The anterior margin of the antennal tubercles have projections called "spurs." The paralabial plates are similar to those of Tanytarsus and meet at the midline. Petioles of lauterborn organs are 3 times as long as the combined length of the last 3 antennal segments (the petioles are fragile and easily destroyed).

Subfamily Diamesinae (approximately 5 genera; 2 pictured)

Diamesa: There are no paralabial plates. The labial plate has an odd number of teeth. The middle tooth and 1st laterals may be lighter than the other teeth. In 1 species pictured, note that the teeth of the labial plate are distinct and the premandibles end in 1 blade, whereas in the other species the labial plate has no distinct teeth and the premandibles are fan-shaped. The antennae have annulated 3rd segments. Consult Johannsen (1937) and Roback (1957) for specific determinations.

Prodiamesa: Paralabial plates are present, and paralabial hairs may be present or absent. As in the Orthocladiinae, the plates appear as caudo-lateral extensions on either side of the labial plate. The mandibles have a long, dark apical tooth and 2 to 4 small, lateral teeth grouped together near the shoulders.

Subfamily Podonominae (5 genera; none pictured)

Subfamily Orthocladiinae (approximately 20 genera; 11 pictured)

Orthocladius: Generally, the labial plate is evenly convex in appearance with 13 teeth and the premandibles end in 1 blade. O. nivoriundus (pictured) is an exception. The labial plate has 14 teeth, and the premandibles are bifid.

Trichocladius: The labial plate has from 12 to 16 teeth; the middle teeth are spadelike and widely separated, except for T. senex (not pictured). The paralabial plates have long hairs.

Nanocladius: The labial plate usually has 12 rounded teeth; the middle teeth are projecting and narrowly separated. The mandibles of some species have serrations, or a long, filamentous projection on the inner basal margin.

Smittia: The labial plates are variable in the number and shape of the teeth. In some species the labial plate is truncate, with light teeth across the apex (Roback 1957). The species pictured has 11 teeth in the labial plate, the middle tooth is largest. The premandibles are bifid, and the antennal blade is stout.

Brillia: The labial plate has 12 or 13 teeth; in the species with 13 teeth the middle tooth is much smaller than the first lateral teeth. The premandibles are bifid or end in a single blade. The antennae are approximately 1/2 as long as the head capsule. The mandibles have a concavity on the outer margin. Brillia par has 12 teeth and the middle teeth are spaced widely apart.

Cardiocladius: The labial plate has 11 teeth; the middle tooth is broad, truncate, and approximately 1/3 the width of the plate. The mandibles are heavy and dark. The dorsal, posterior margin of the head capsule has a wide, dark margin, and deep, medial notch.

Psectrocladius: The labial plates may have an even or odd number of teeth but characteristically the lateral teeth of the labial plate are partially fused. The middle teeth are light and wide with small, dark projecting tips, or are as dark as the lateral teeth and project distinctly (Sublette, 1964). In those species with an odd number of teeth, the middle tooth is wide, light, and dome-shaped. The mandibles characteristically are scythe-shaped with a long, dark-tipped apical tooth, and 3 or 4 lateral teeth close-set near the inner shoulder. The premandibles are curved sharply and end in one blade.

Metriocnemus: The labial plates of those species found in the United States have 12 or 14 teeth as pictured. The mandibles are strong and heavy in appearance, and dark nearly 1/2 of their length. The mandibular brush is prominent.

Diplocladius: The labial plates have 14 teeth, all nearly even. Large bristles are located near the inner posterior margin of each paralabial plate. The mandibles are dark nearly 2/3 of their length.

Cricotopus: The labial plate has 11 or 13 teeth; the middle tooth curves evenly or is slightly flattened and the 1st lateral teeth are sometimes notched. The mandibles may be crenulated on their outer margins or serrated on the inner basal margins. The premandibles are bifid or end in a single blade. Some species have hair pencils (tufts) on the sides of the body segments (see Figure 1).

Corynoneura: The labial plates have 13 teeth; the middle tooth is much smaller than the 1st laterals. The lateral teeth are arranged in a 45° angle from the apex of the labial plate, making the plate appear narrow. The larvae are easily distinguished from other Orthocladiinae by the elongated antennal segments, which are nearly as long or longer than the head capsule. The 2nd and/or 3rd segments are dark. The posterior prolegs bear dorsal "spines" (pointed hairlike structures) that are used for specific identifications.

GENERA PICTURED

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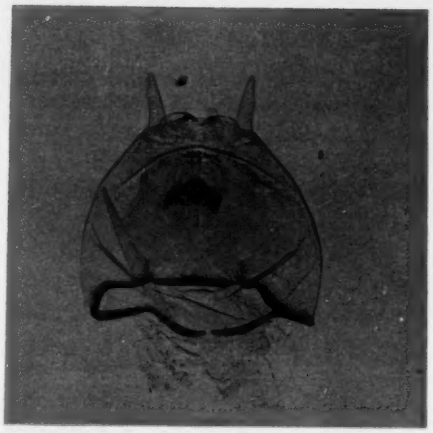
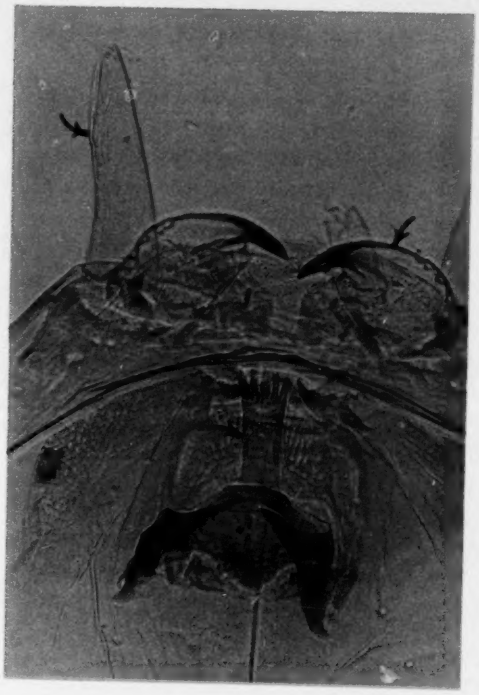
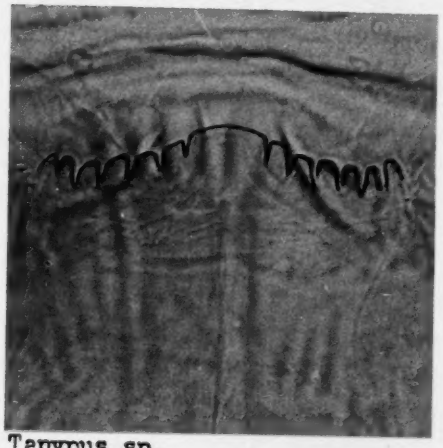
Tanypodinae



Tanypus sp.
View of Head X25

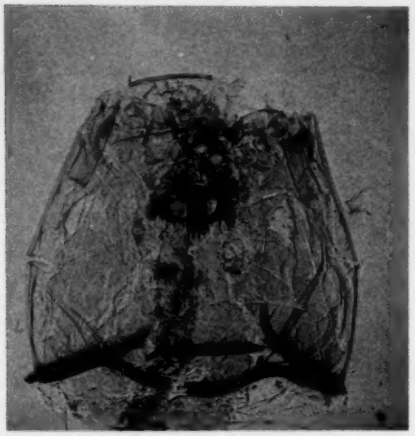


Tanypus sp.
Lingua X160 Note 5 light teeth



Tanypus sp.
Paralabials X160

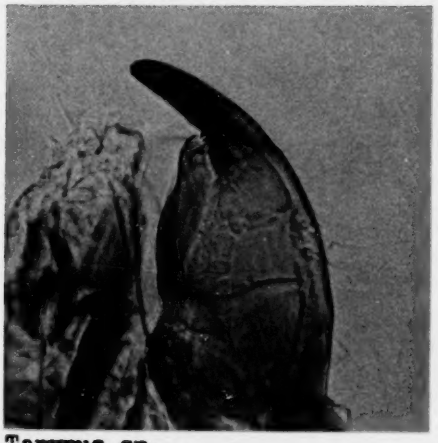
Tanypodinae



Tanypus sp.
View of Head X25

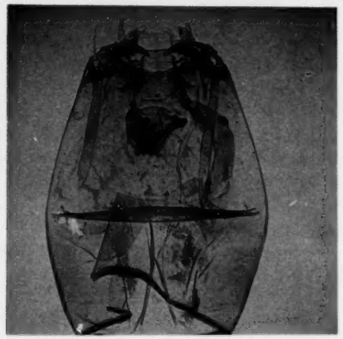
Tanypus sp.
Paralabials X100

Tanypus sp.
Lingua X160

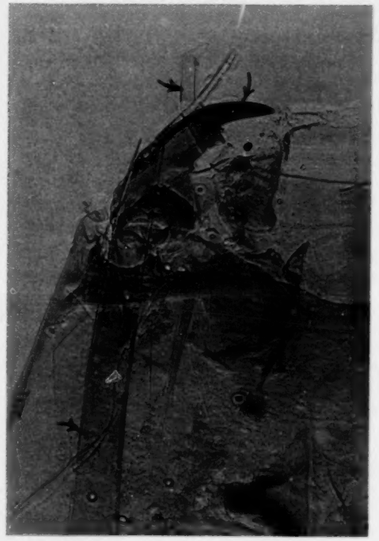


Tanypus sp.
Mandible X160
Note the inflated basal portion

Tanypodinae
Tribe Pentaneurini



Ablabesmyia sp.
View of Head X25

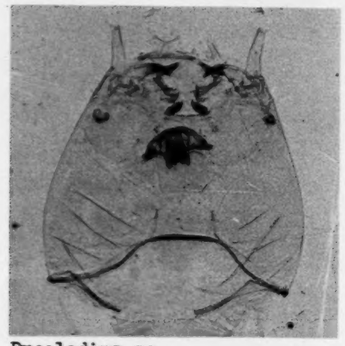


Ablabesmyia sp.
Ensheathed antenna, mandible, and maxillary palp X64

Ablabesmyia sp.
Lingua and superlingua X100

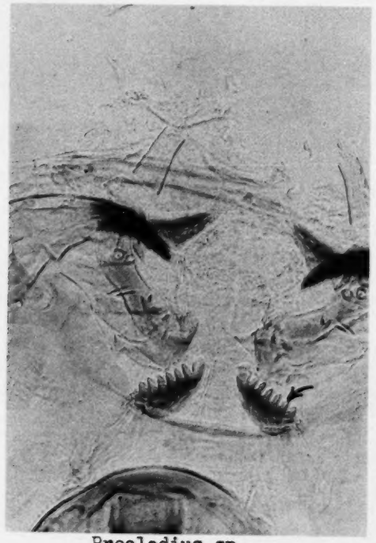
Note: Morphological differences in the head structures of the Pentaneurini are associated with other body characteristics to differentiate genera; consult Beck and Beck (1966)

Tanypodinae



Procladius sp.
View of Head X25

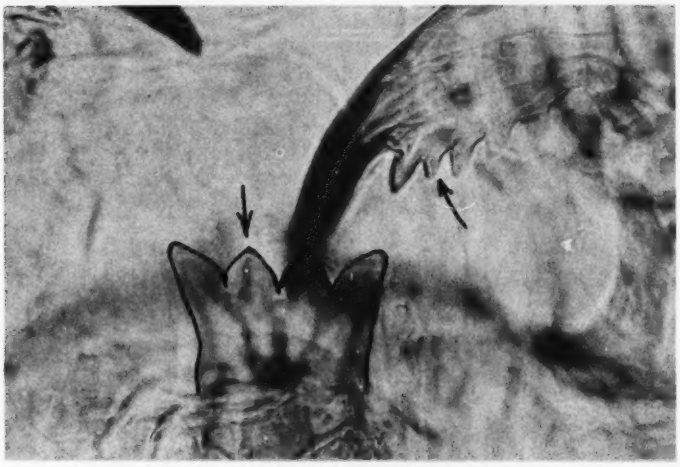
Procladius sp.
Lingua X100 Note 5 dark teeth



Procladius sp.
Paralabial combs X64

Tanypodinae

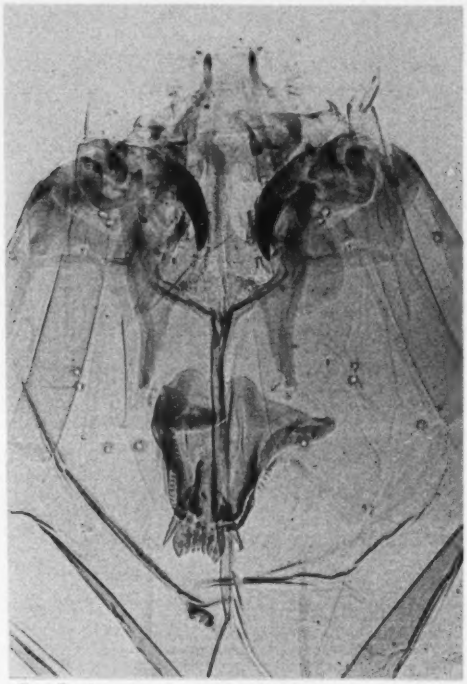
Anatopynia (Psectrotanypus) sp.*
View of Head X64



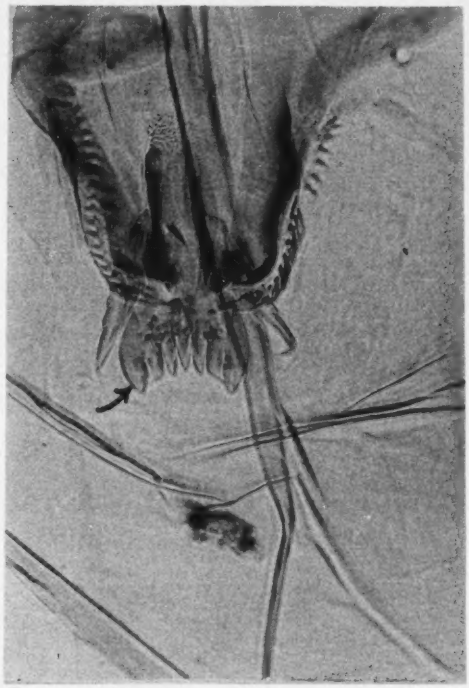
A. (Psectrotanypus) sp.
Lingua and mandible X160
Note 4 light teeth of lingua and
large lateral teeth on mandible

* Specimen in the collection of Dr. Sublette

Tanypodinae

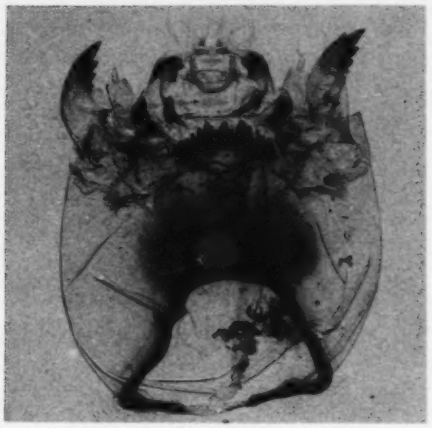


Coelotanypus concinnus
View of Head X64



C. concinnus
Lingua X160 Note 7 light teeth

Chironominae
Tribe: Chironomini

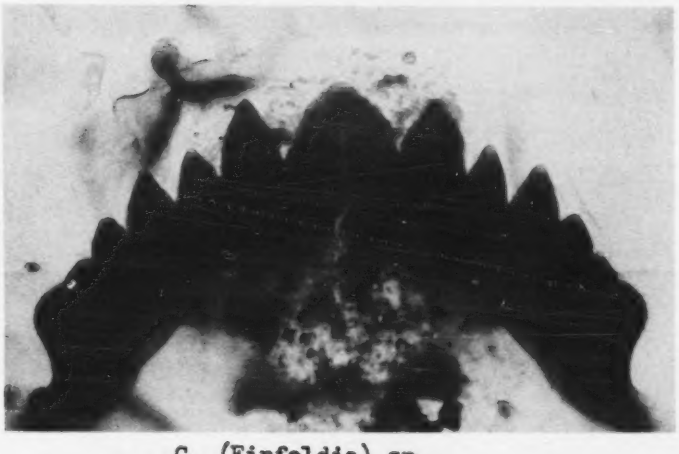


Chironomus (Chironomus) sp.
View of Head X25

C. (Chironomus) sp.
Labial plate, paralabials,
mandible, and antennae X64
Note the trifid middle tooth of
the labial plate

Chironominae
Tribe Chironomini

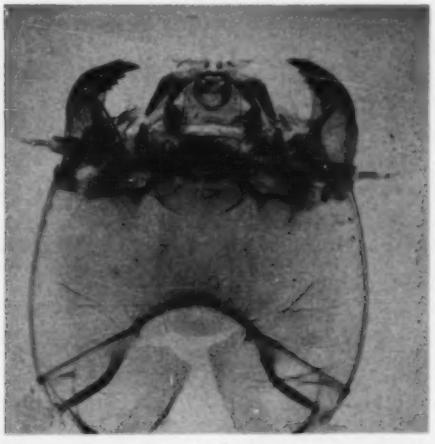
Chironomus (Einfeldia) sp.*
View of Head X64 Note the extreme indentations on the mandibles and labial plate; the almost fused 5th and 6th laterals



C. (Einfeldia) sp.
Labial plate X160 compare with the labial plate of C. (Dicrotendipes) sp.

*Correspondence with Dr. Roback (August 1967)

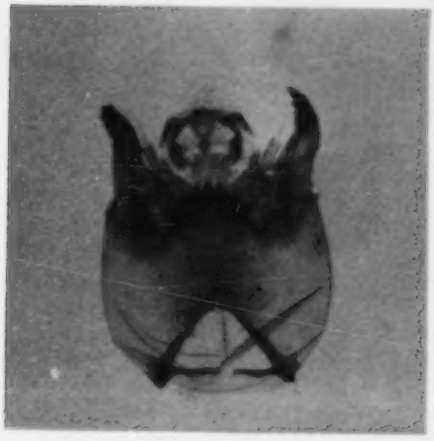
Chironominae
Tribe: Chironomini



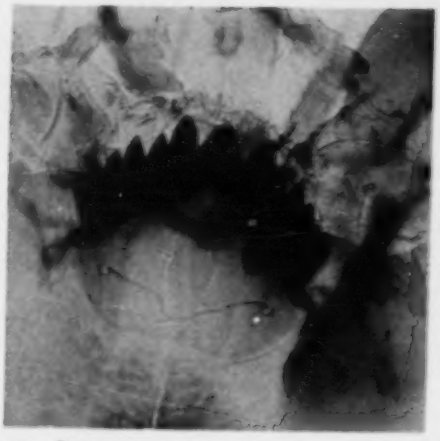
Chironomus (? Kiefferulus) sp.
View of Head X25

C. (? Kiefferulus) sp.
Epipharyngeal area, labial plate, and mandible X100 Note the deep, lateral notches on the middle tooth of the labial plate; the premandible has 6 blades; the maxillary palpus is indicated by an arrow

Chironominae
Tribe: Chironomini



Chironomus (Dicrotendipes) sp.
View of Head X25

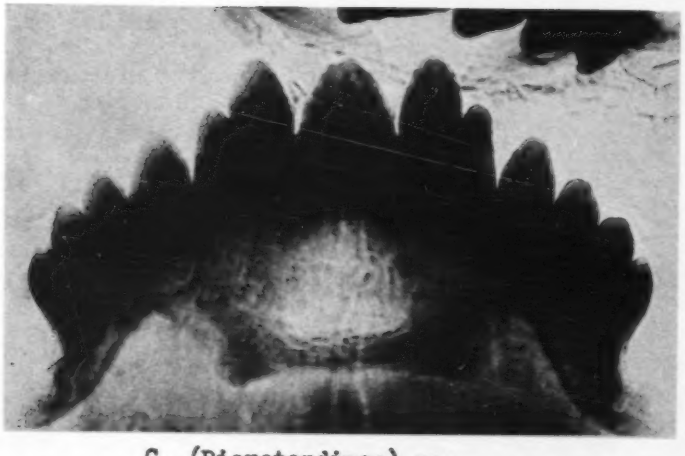


C. (Dicrotendipes) sp.
Labial plate and paralabial plates X64

C. (Dicrotendipes) nervosus
Labial plate and mandible
X100 Note the equally compound 3rd lateral tooth of the mandible

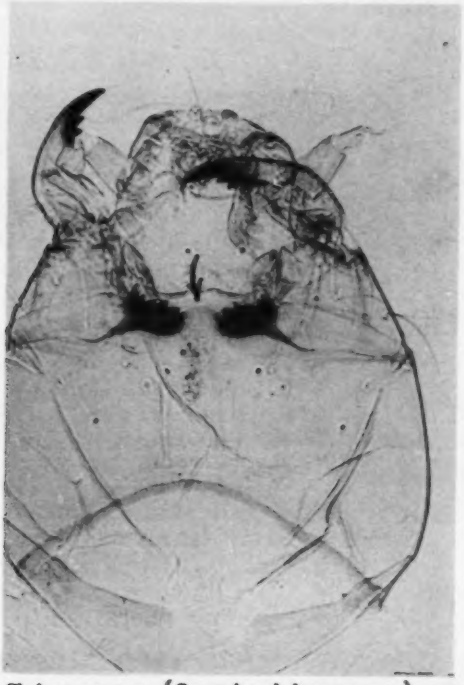
Chironominae
Tribe Chironomini

Chironomus (Dicrotendipes) sp.
Labial plate and mandibles X100

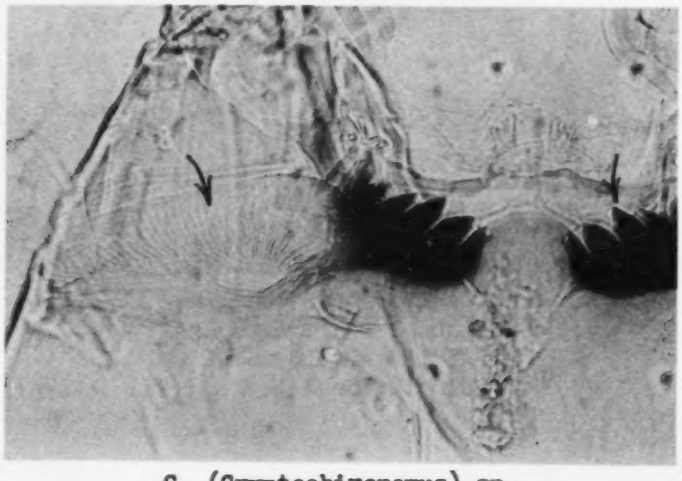


C. (Dicrotendipes) sp.
Labial plate X160 Note the
simple middle tooth and the
almost fused 1st and 2nd laterals

Chironominae
Tribe: Chironomini



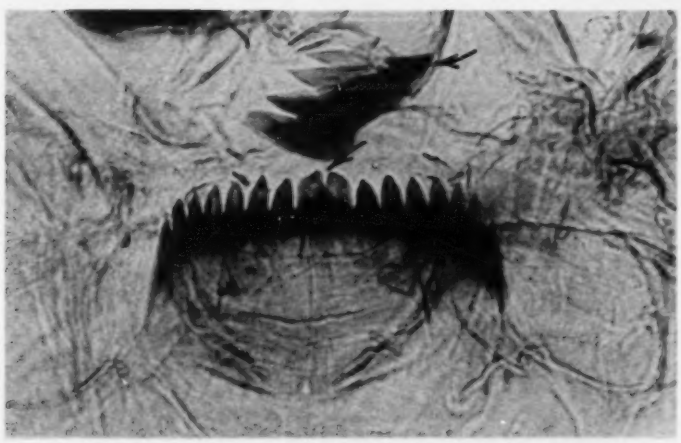
Chironomus (Cryptochironomus) sp.
View of Head X64 Note the wide, light, middle tooth of the labial plate flanked by oblique laterals



C. (Cryptochironomus) sp.
Labial plate and paralabial
X160

Chironomidae
Tribe Chironomini

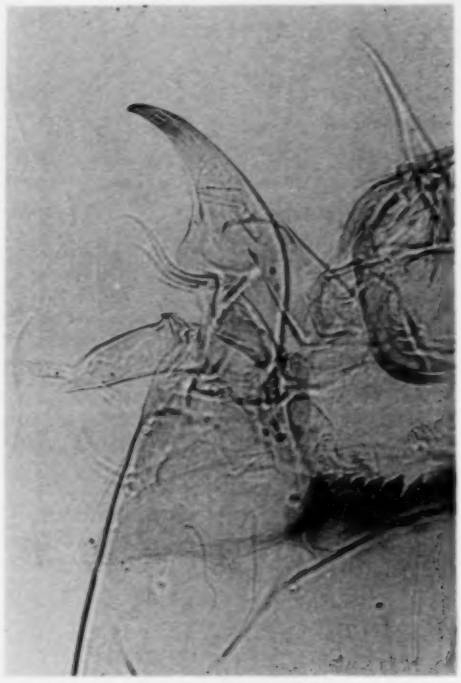
Chironomus (Cryptochironomus) pectinatellae View of Head X64



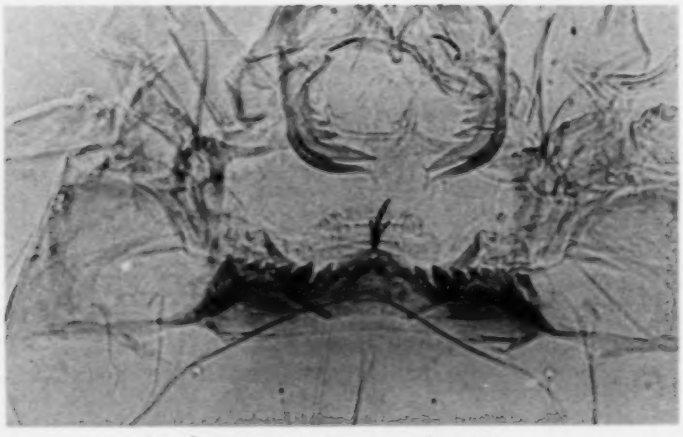
C. (Cryptochironomus) pectinatellae
Labial plate and premandible X160
Note the divided middle tooth of the labial plate

Chironominae
Tribe: Chironomini

Chironomus (Cryptochironomus) nais
View of Head X100

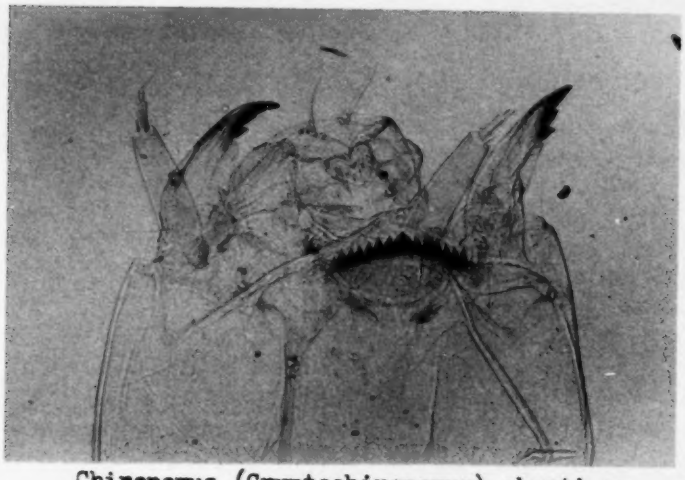


C. (Cryptochironomus) nais
mandible and premandible X160

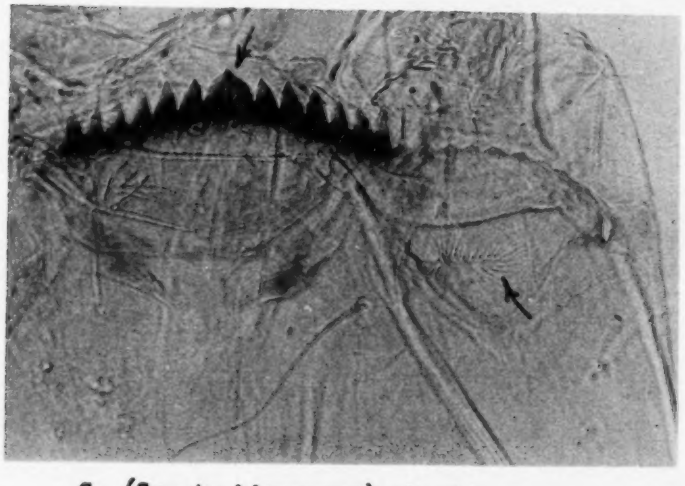


C. (Cryptochironomus) nais
Labial plate X160 Note the
median notch in the middle tooth

Chironominae
Tribe: Chironomini

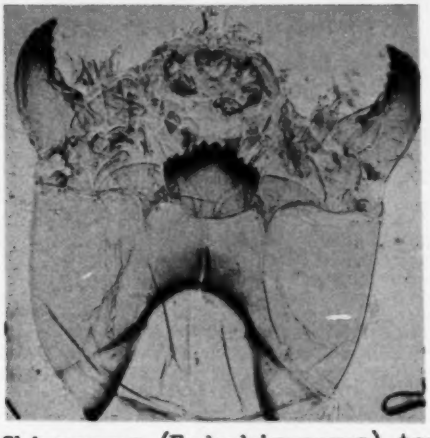


Chironomus (Cryptochironomus) abortivus
View of Head X64



C. (Cryptochironomus) abortivus
Labial plate and paralabial X160
Note the recurved striations on the paralabial plate and the large, peaked middle tooth of the labial plate

Chironominae
Tribe: Chironomini



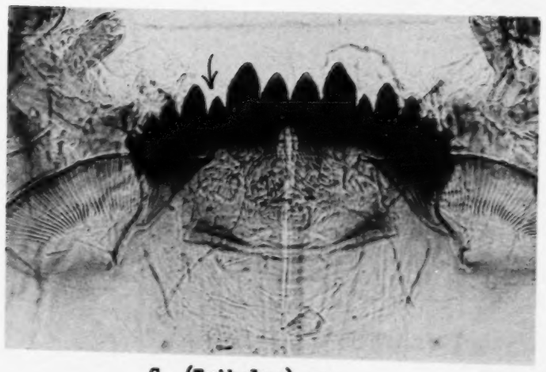
Chironomus (Endochironomus) tendens
View of Head X25

C. (Endochironomus) tendens
Labial plate X160 Note the low middle tooth with lateral notches

Chironominae
Tribe: Chironomini

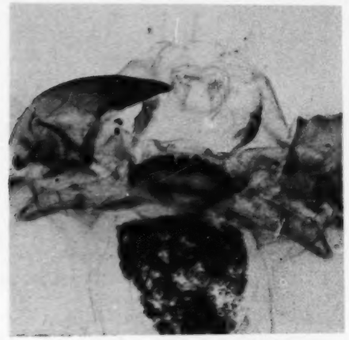
Chironomus (Tribelos) sp.
View of Head X25

C. (Tribelos) sp.
Antenna X100
Note 5 segments as contrasted to 6 in Stictochironomus sp.



C. (Tribelos) sp.
Labial plate and paralabials X100 Note the short 2nd laterals of the labial plate

Chironominae
Tribe: Chironomini

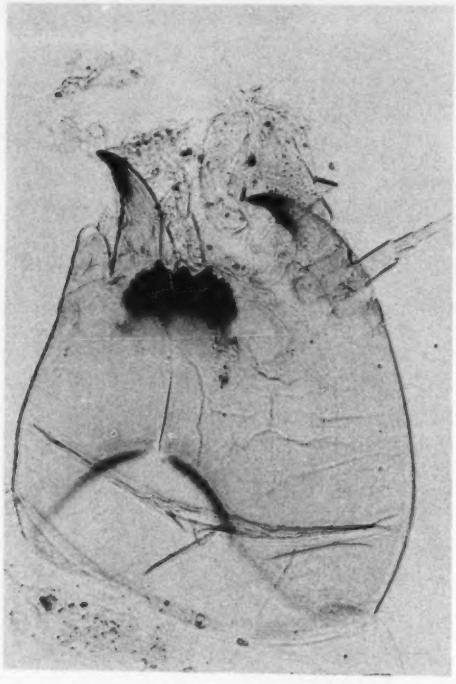


Chironomus (Xenochironomus) sp.
View of Head X25

Xenochironomus sp.
Premandible X100

Xenochironomus sp.
Labial plate X64 Note the paralabials nearly touch on the midline; the low rounded teeth of the labial plate; the indistinct teeth of the mandible

Chironominae
Tribe: Chironomini



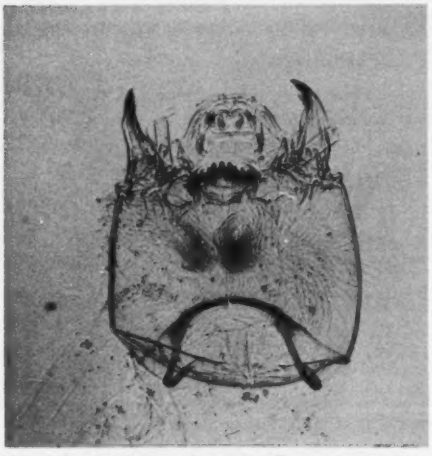
Chironomus (Xenochironomus) xenolabis
View of head X100

X. xenolabis
Labial plate, paralabials, and mandibles X160

X. xenolabis
More mature larva
View of Head X64

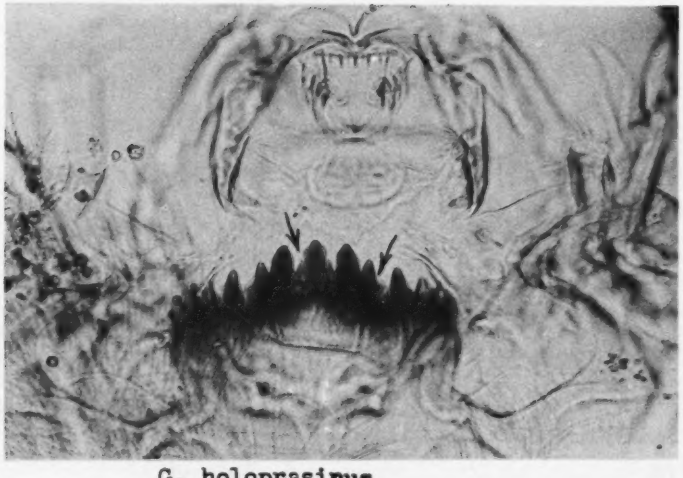
X. xenolabis
More mature larva: note that the small teeth of the labial plate are no longer present X100

Chironominae
Tribe: Chironomini



Goeldichironomus holoprasinus *
View of Head X25

G. holoprasinus
Mandible X160 Note the mesal tooth perpendicular to the lateral teeth



G. holoprasinus
Hypopharynx and labial plate X100
Note the deep notches on the middle tooth of the labial plate and the 2nd laterals with light flanges

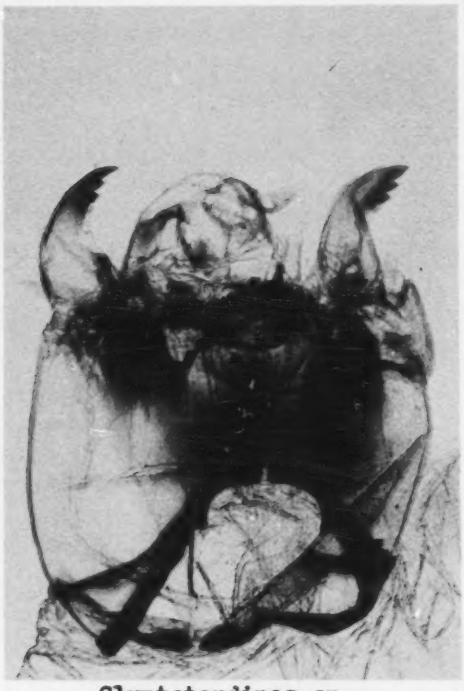
*(= Chironomus fulvipilus): From the collection of Dr. Sublette

Chironominae
Tribe: Chironomini

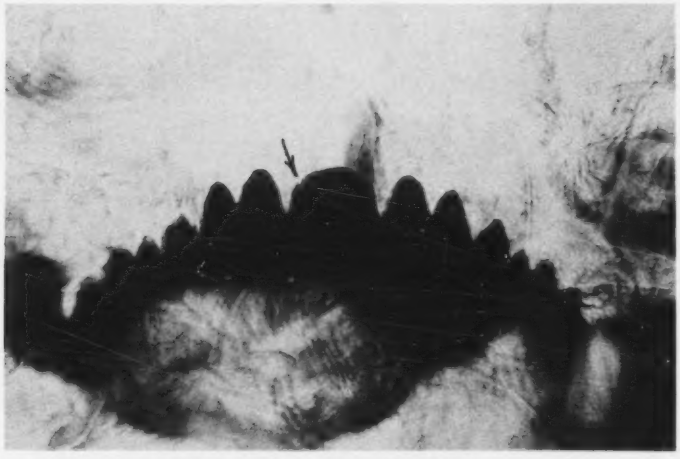
Glyptotendipes sp. X25

Glyptotendipes sp.
Labial plate and mandible. X64
Note the low, rounded middle tooth of the labial plate

Chironominae
Tribe: Chironomini

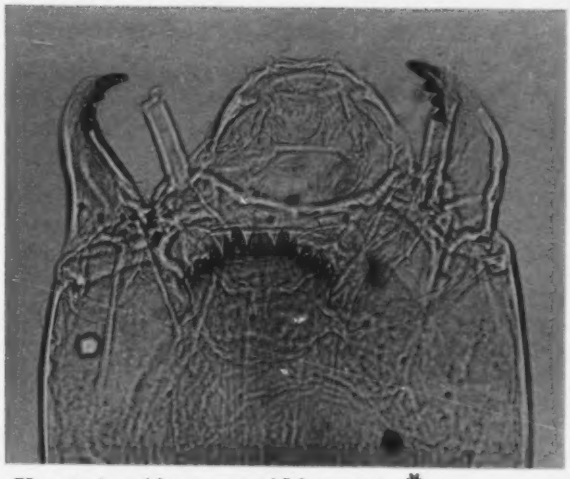


Glyptotendipes sp.
View of Head X25



Glyptotendipes sp.
Labial plate X100
Note the shallow,
lateral notches on the
middle tooth

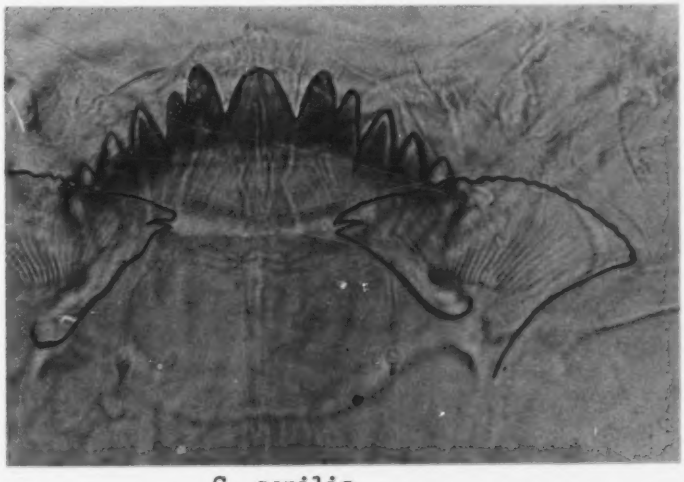
Chironominae
Tribe Chironomini



Glyptotendipes senilis Joh.*
View of Head X64

*Paratype from the Cornell University Museum; specimen collected from the Hudson River at Beacon, N.Y. August 17, 1936

G. senilis
Mandible X160 Note that each lateral tooth differs in shape; the dorso-mesal tooth is dark and stubby

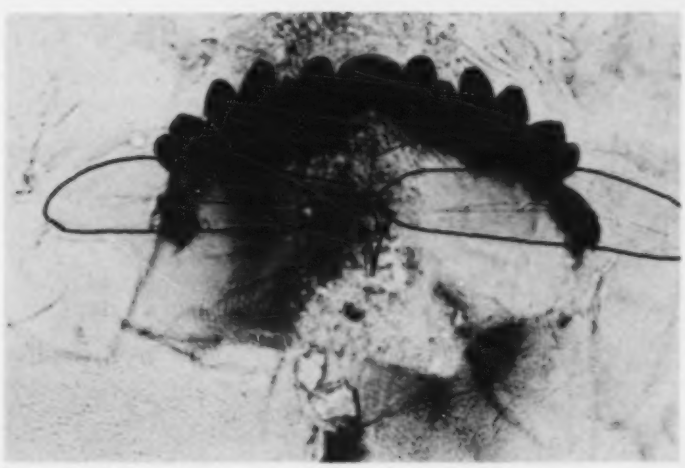


G. senilis
Labial plate and paralabials X160
Note that the 3rd and 4th laterals overlap each other; middle tooth barely notched and shorter than 1st laterals; paralabial with a fine cleft on inner margin

Chironominae
Tribe: Chironomini

Pseudochironomus sp.
View of Head X25

Pseudochironomus sp.
Mandible and antenna X100



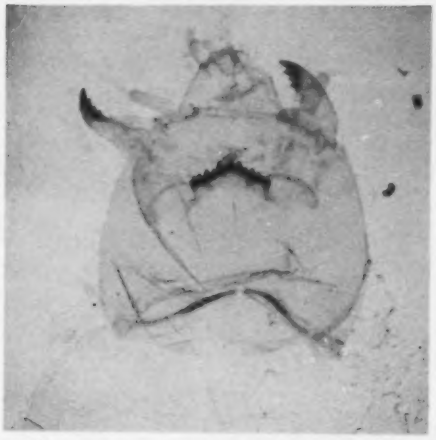
Pseudochironomus sp.
Labial plate and paralabials X100. Note the paralabials nearly touch on the midline

Chironominae
Tribe: Chironomini

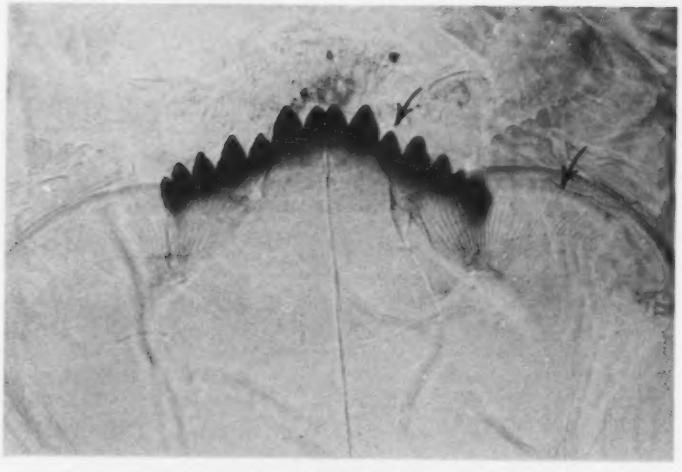
Polypedilum sp.
View of Head X100

Polypedilum sp.
Labial plate and mandible X160
Note the short 1st laterals
of the labial plate

Chironominae

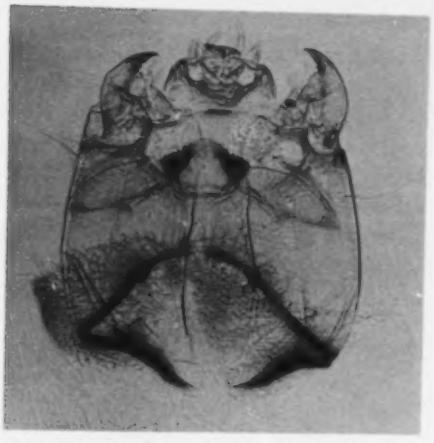


Chironomus (Endochironomus)
View of Head X25



Chironomus (Endochironomus)
Labial plate and paralabials X100

Chironominae
Tribe: Chironomini

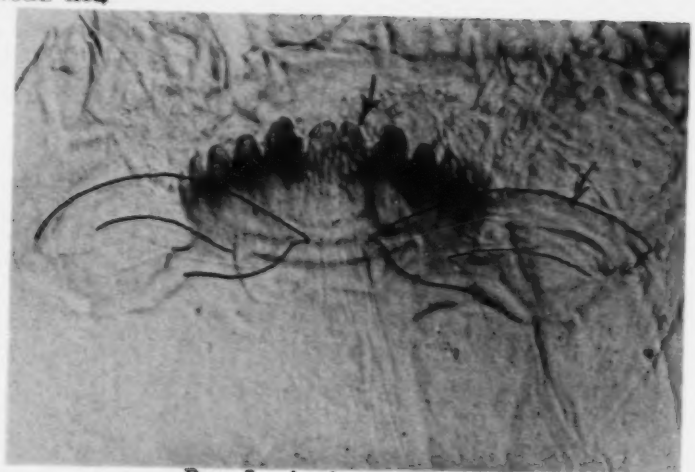


Paralauterborniella sp.
View of Head X64

Paralauterborniella sp.
Labial plate and paralabials X160
Note the wide, light middle tooth of the labial plate, but the laterals are not oblique as in Chironomus (Cryptochironomus) sp.

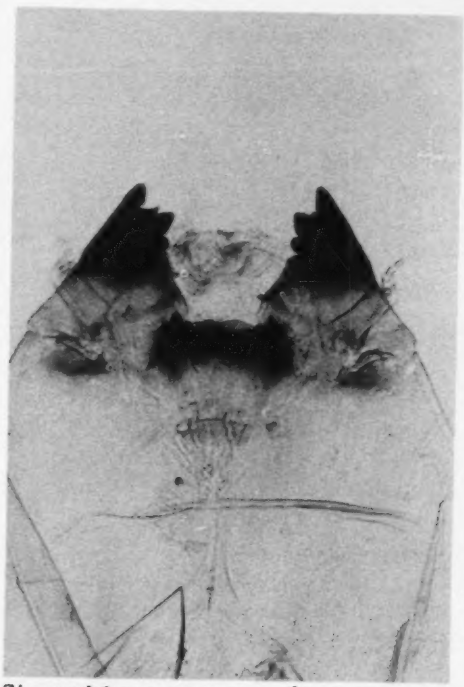
Chironominae
Tribe: Chironomini

Paralauterborniella sp.
View of Head X64

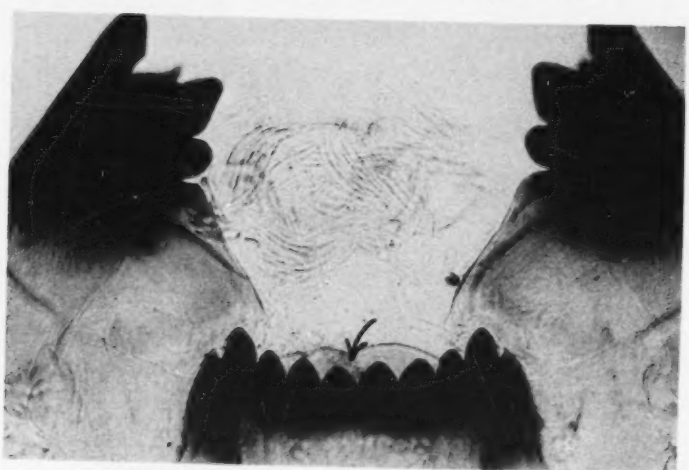


Paralauterborniella sp.
Labial plate and paralabials
X160 Note the similarities of the
labial plate to Microtendines

Chironominae
Tribe Chironomini



* Stenochironomus sp. (= Cryptochironomus s. l. sp. B Joh.) View of Head X64

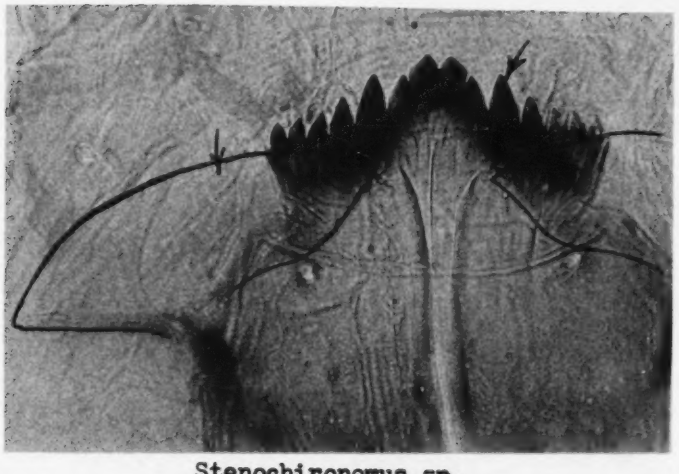


Stenochironomus sp.
Labial plate, fused paralabials, and mandibles X160 Note the concave labial plate

* Correspondence with Dr. Beck (September 20, 1967)

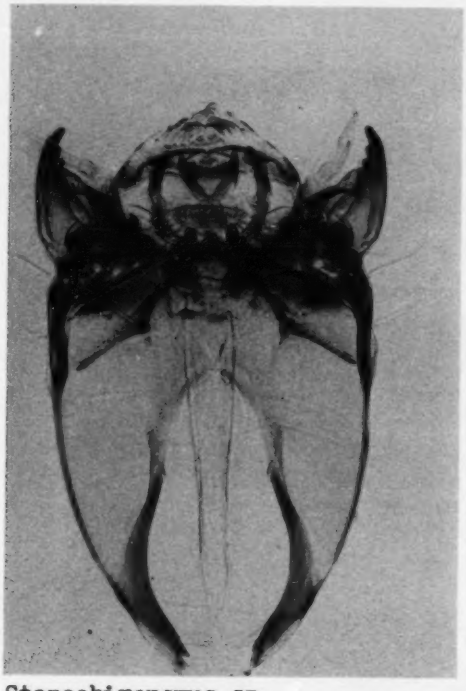
Chironominae
Tribe Chironomini

Stenochironomus sp.
View of Head X100

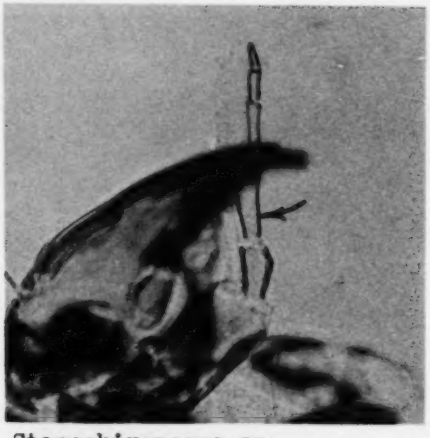


Stenochironomus sp.
Labial plate and paralabials
X160

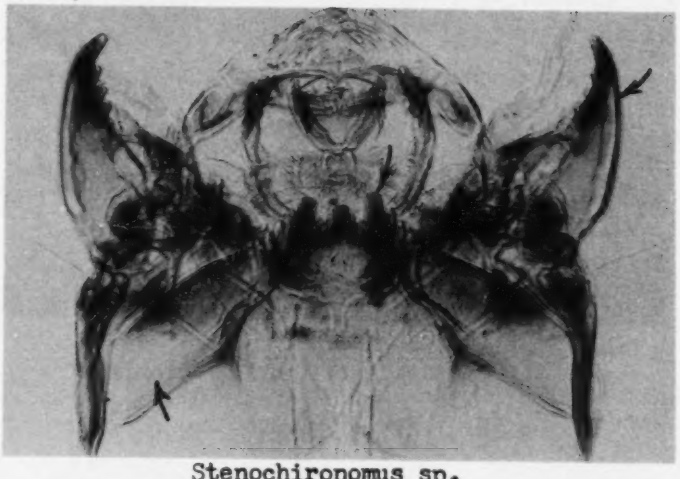
Chironominae
Tribe: Chironomini



Stenochironomus sp.
View of Head X64



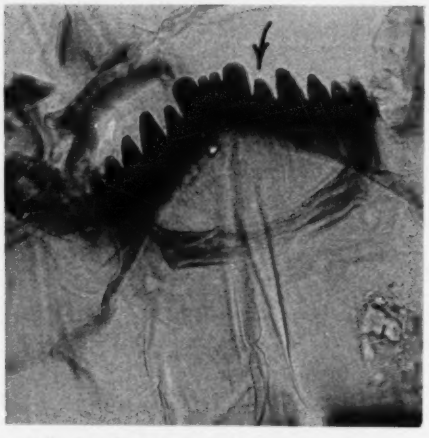
Stenochironomus sp.
Antenna X160 Note 6 segments



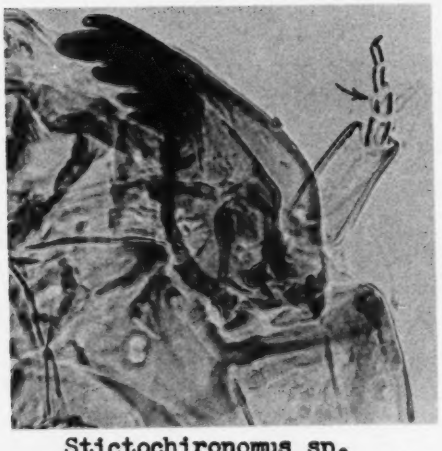
Stenochironomus sp.
Labial plate, paralabials,
and mandibles X100

Chironominae
Tribe Chironomini

Stictochironomus sp.
View of Head X64

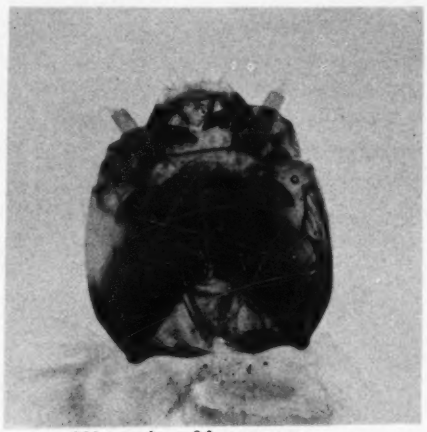


Stictochironomus sp.
Labial plate and paralabial plate X100 Note the 4, even middle teeth of the labial plate; the paralabial has punctations



Stictochironomus sp.
Mandible and antenna X160
Note the 6 -segmented antenna

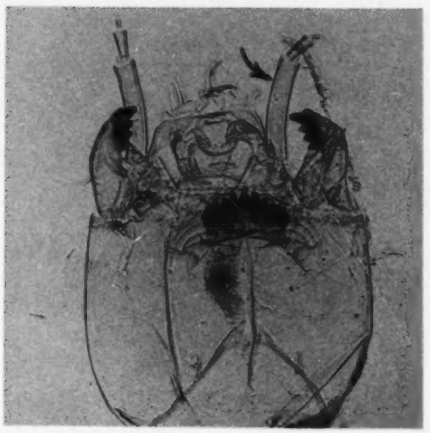
Chironominae
Tribe: Chironomini



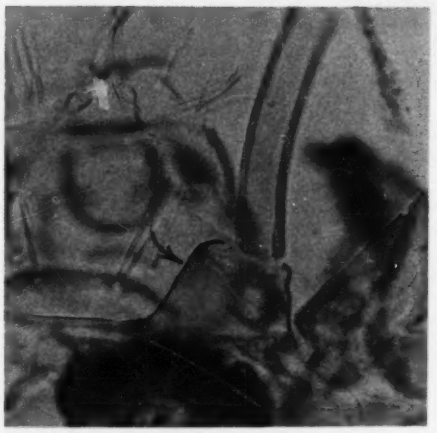
Microtendipes sp.
View of Head X25

Microtendipes sp.
Labial plate, paralabials,
and mandibles X100

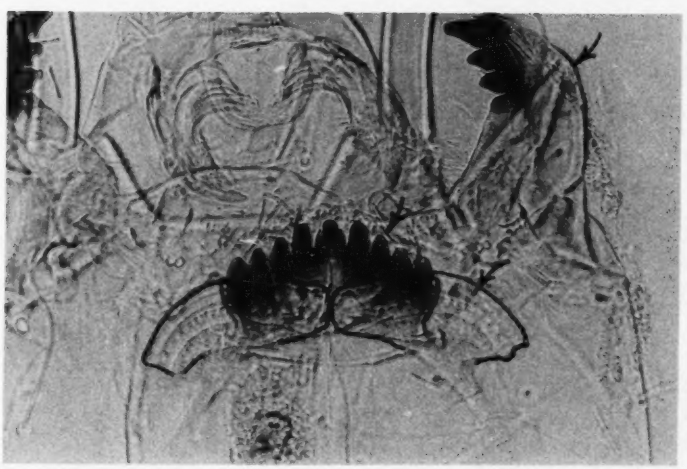
Chironominae
Tribe: Tanytarsini



Tanytarsus sp.
View of Head X25
Note the long, curved 1st antennal segments

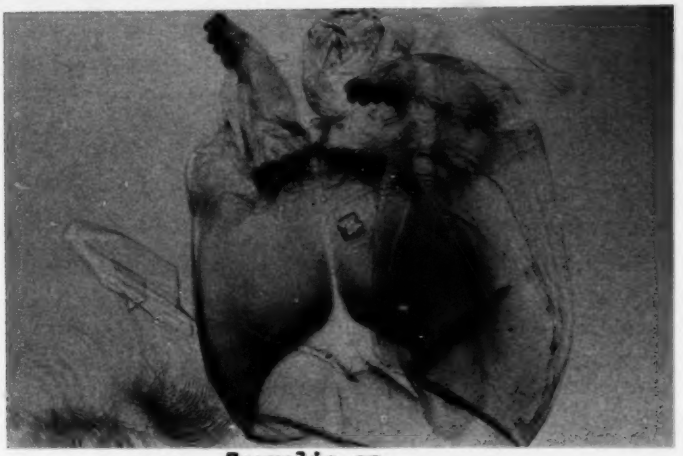


Tanytarsus sp
Antennal tubercle X160
Note this distinctive character separates the Tanytarsini from the Chironomini

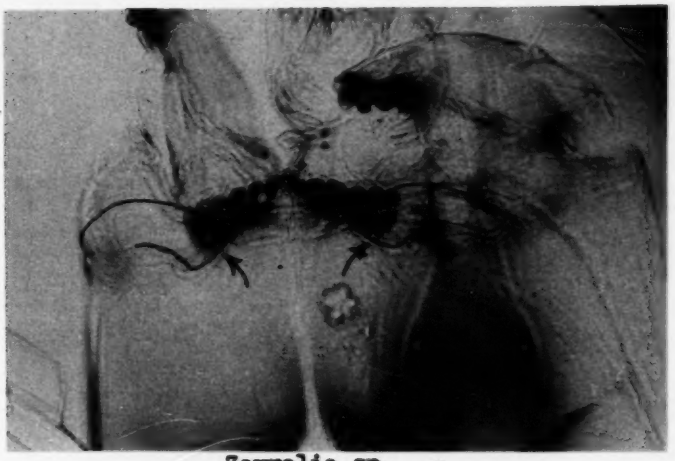


Tanytarsus sp.
Labial plate, paralabials, and mandible X160

Chironominae
Tribe Tanytarsini



Zavrelia sp.
View of Head X100



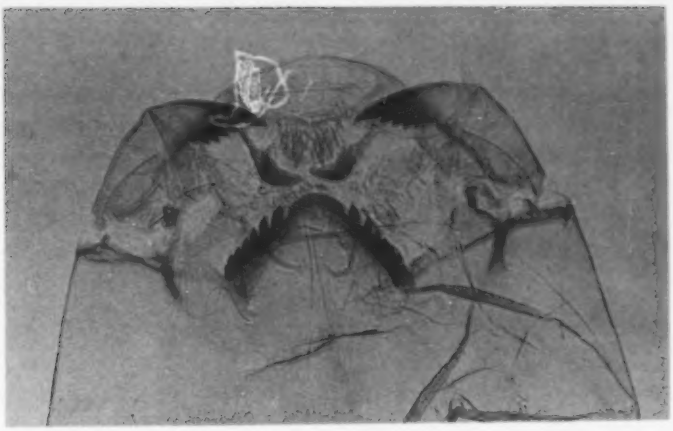
Zavrelia sp.
View of Head X160
Note that the paralabials
do not meet on the midline
as in Tanytarsus sp.

Chironominae
Tribe Tanytarsini

Micropsectra sp.
View of Head X64

Micropsectra sp.
Antennal tubercle X160
Note the spur on the tubercle; Tanytarsus sp. has no spur.

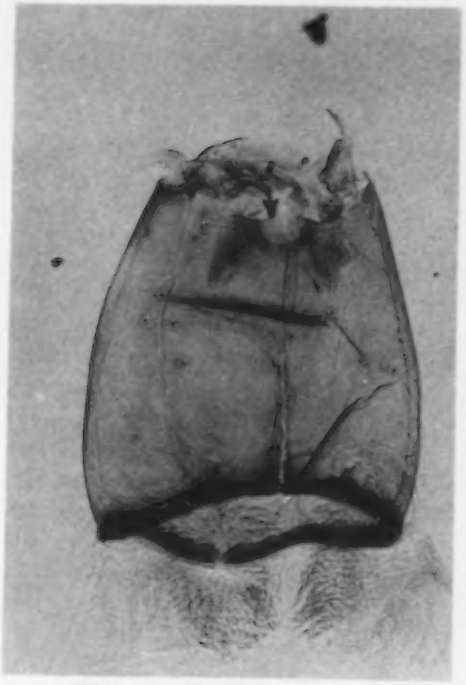
Diamesinae



Diamesa sp.
View of Head X64

Diamesa sp.
Labial plate and premandibles
X160

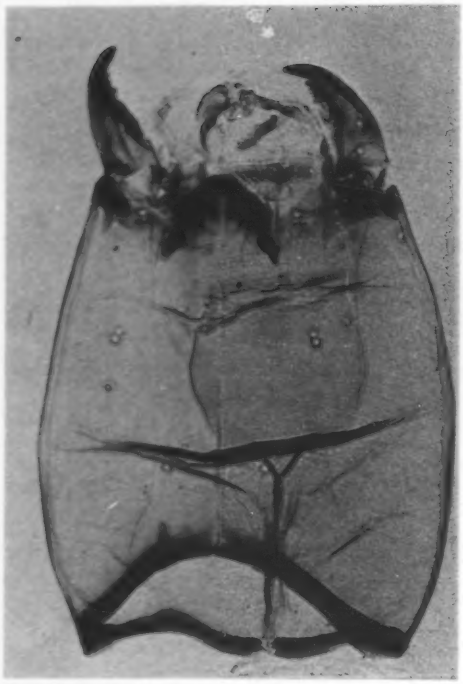
Diamesinae



Diamesa longimanus
View of Head X64
Note undulated labial plate

D. longimanus
Note fan-shaped premandible X160

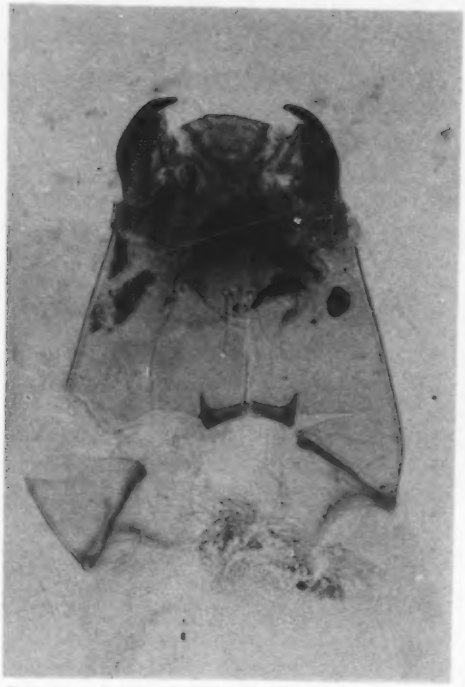
Diamesinae



Prodiamesa sp.
Head view X100

Prodiamesa sp.
View mandible and premandibles
X160

Diamesinae

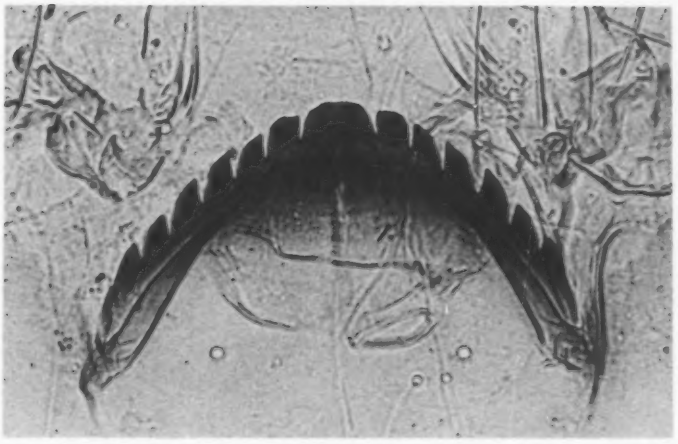


Prodiamesa bathyphila
View of Head X64

P. bathyphila
Labial plate and mandible
X160

Orthocladiinae

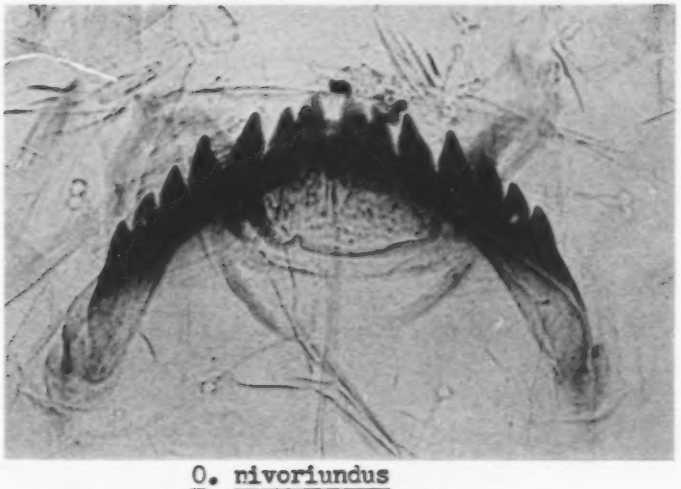
Orthocladius sp.
View of Head X64



Orthocladius sp.
Labial plate X160
Note the even, convex appearance and round middle tooth

Orthocladiinae

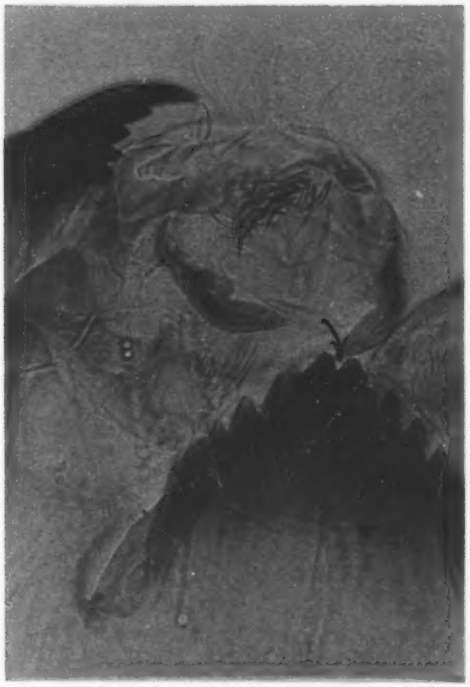
Orthocladius nivoriundus
View of head X64
Note the bifid premandibles



O. nivoriundus
Labial plate X160
Note 14 teeth

Orthocladiinae

Trichocladius sp.
View of Head X100



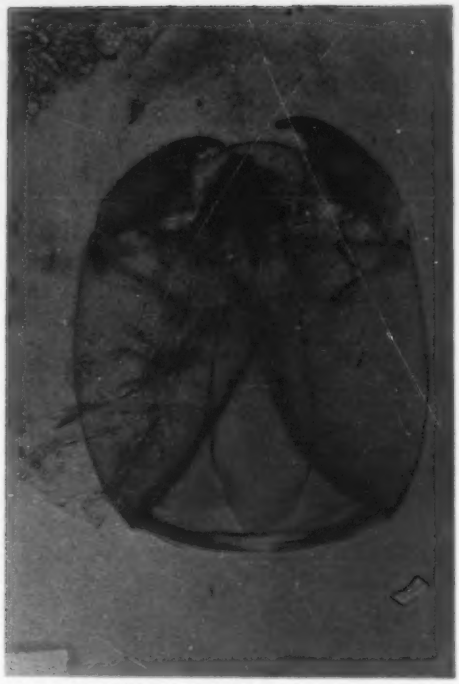
Trichocladius sp.
Labial plate and premandibles X160
Note the separation between the spadelike middle teeth of the labial plate

Orthocladiinae

Nanocladius sp.
View of Head X64

Nanocladius sp.
View of Head X160
Note that the middle teeth of the labial plate are not as widely separated as in Trichocladius sp.

Orthocladiinae



Nanocladius sordens
View of Head X100

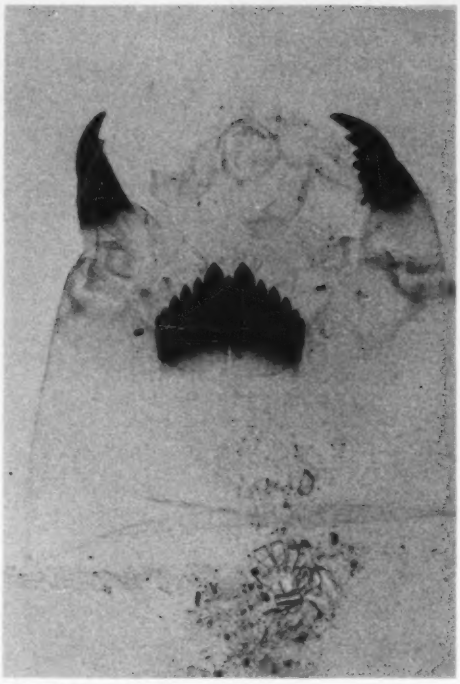
Nanocladius sordens
Labial plate and mandibles X160
Note the labial plate with 10 teeth; the middle pair elongated

Orthocladiinae

Smittia aterrima
View of Head X64

S. aterrima
Labial plate and mandibles
X160 Note labial plate with
11 teeth and large antennal blade

Orthocladiinae

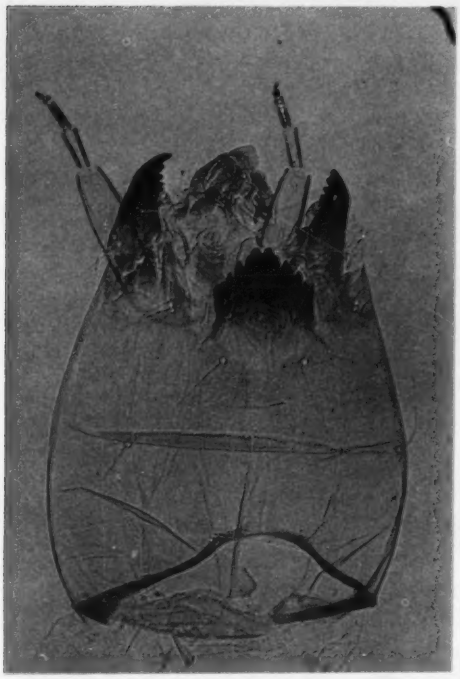


Brillia sp.*
View of Head X64

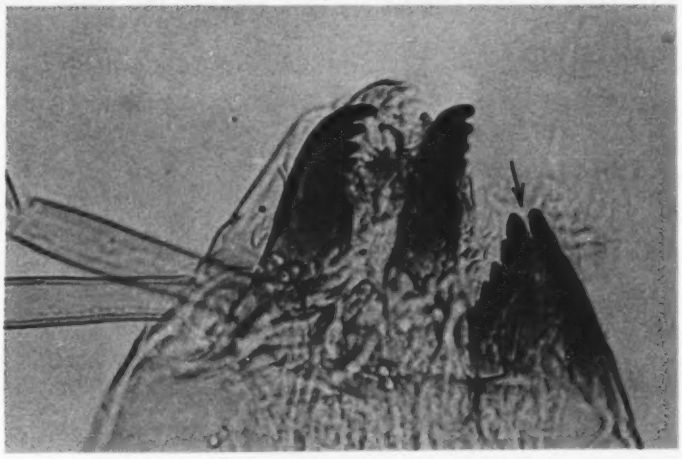
Brillia sp.
Labial plate and premandibles X100 Note the small middle tooth of the labial plate.

* Specimen in the collection of Donald G. Stevens, Biologist, Pacific Northwest Water Laboratory, FWPCA, Corvallis, Oregon

Orthocladiinae

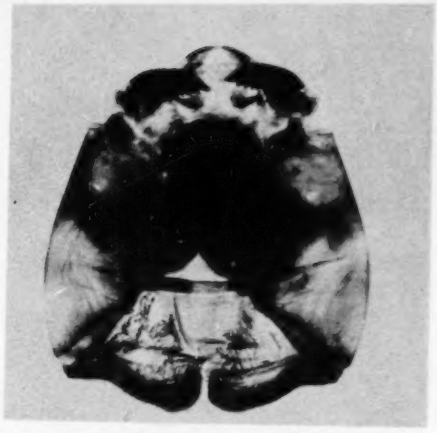


Brillia par
View of head X100
Note that the antennae are half as long as the head capsule

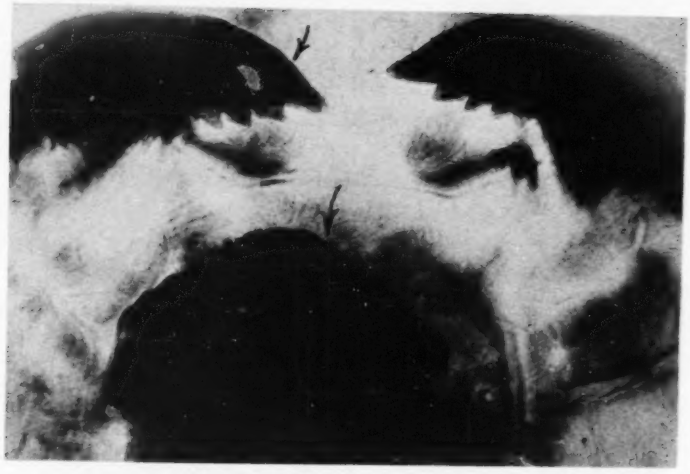


B. par
Lateral view of labial plate and mandibles X160 Note the distinctive gap between the middle teeth of the labial plate

Orthocladiinae

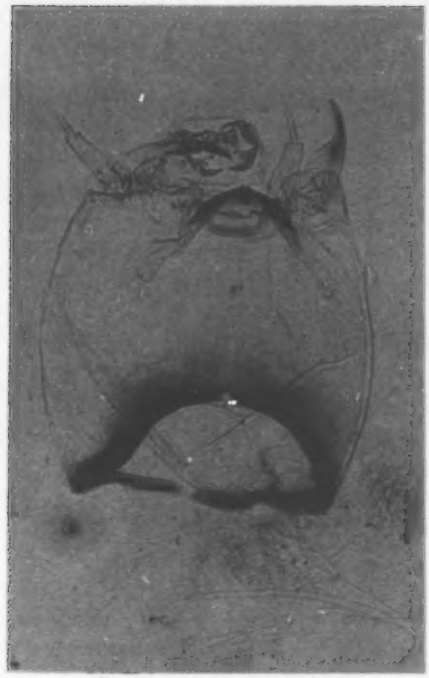


Cardiocladius sp.
View of Head X25



Cardiocladius sp.
Labial plate and mandibles X100

Orthocladiinae



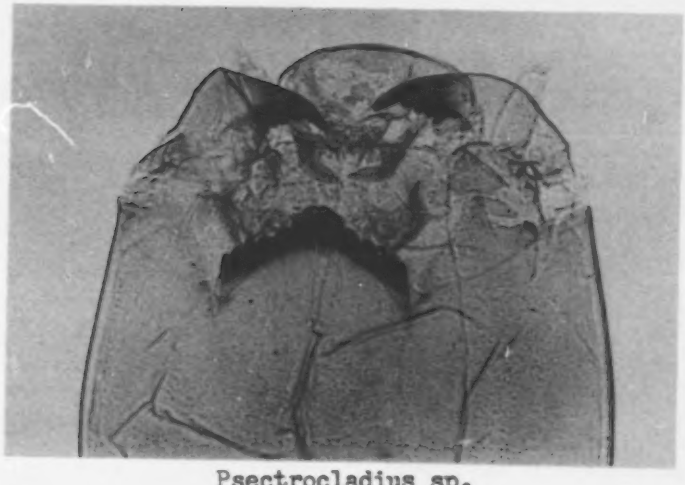
Psectrocladius sp.
View of head X64

Psectrocladius sp.
Labial plate and mandibles X160
Note the scythe-shaped mandibles and the small, dark tips on the light middle teeth of the labial plate

Orthocladiinae

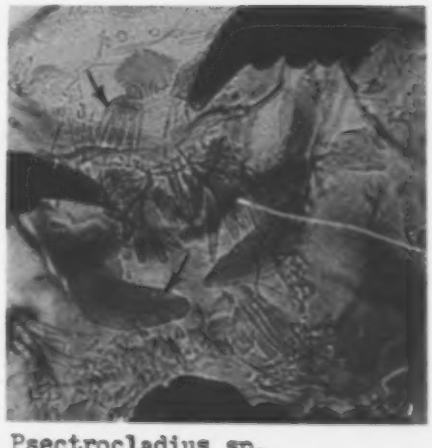
Psectrocladius sp.
View of head X160
Note the wide, light, dome-shaped middle tooth of the labial plate; the darker lateral teeth are hidden underneath the paralabial plates

Orthocladiinae



Psectrocladius sp.
View of Head X64

Psectrocladius sp.
Labial plate and mandible X100



Psectrocladius sp.
Premandibles and labral spines X160

Orthocladiinae

Metriocnemus sp.
View of Head X25

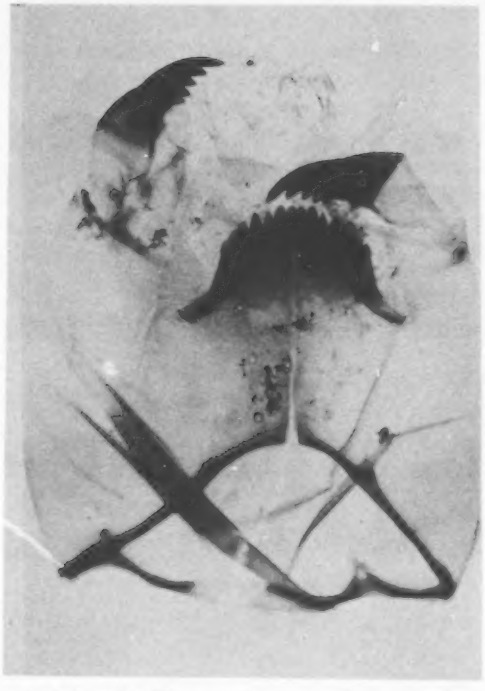
Metriocnemus sp.
Labial plate and mandibles
X64

Orthocladiinae

Metriocnemus sp.
View of Head X64

Metriocnemus sp.
Labial plate and mandible
X160 Note the variation in the labial plate with the species on the preceding page

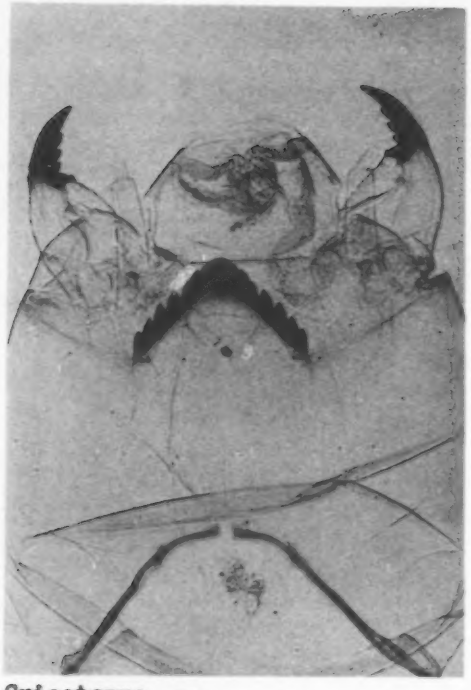
Orthocladiinae



Diplocladius sp.
View of Head X64

Diplocladius sp.
Labial plate and mandibles
X100 Note the relatively even teeth of the labial plate

Orthocladiinae

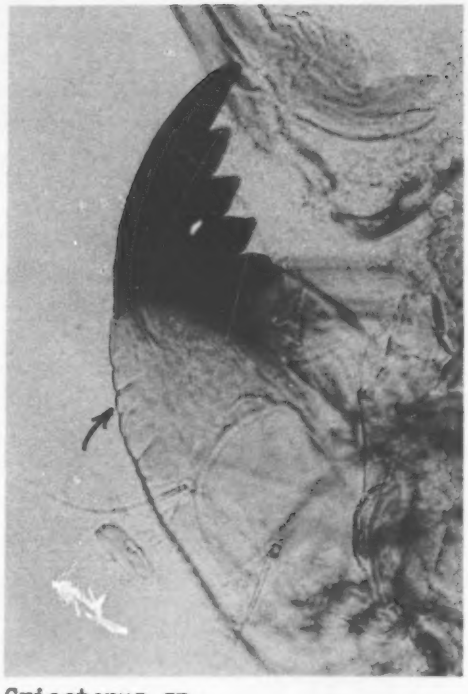


Cricotopus sp.
View of Head X64

Cricotopus sp.
Mandible X160 Note the serrations on the inner margin

Orthocladiinae

Cricotopus sp.
View of Head X64



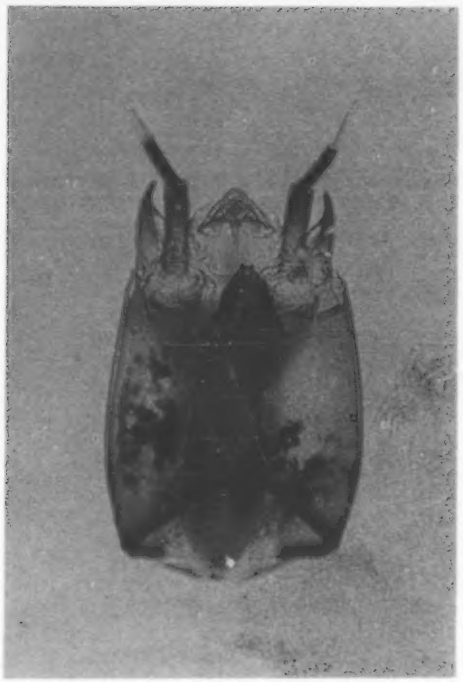
Cricotopus sp.
Mandible and premandible X160.
Note the crenulations on the outer margin of the mandible

Orthocladiinae

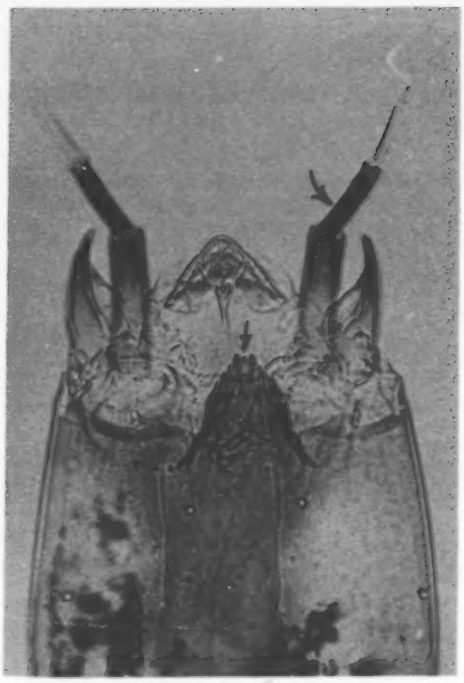
Cricotopus sp.
View of Head X64
Note that the labial plate apparently has 7 teeth (see below)

Cricotopus sp.
Labial plate X160
Note that the middle tooth is actually composed of 5 teeth

Orthocladiinae



Corynoneura sp.
View of Head X100



Corynoneura sp. X160
Note the elongate antennae with dark 1st and 2nd segments; the minute middle tooth of the labial plate.

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